Allen R. Grasser, PE
City Engineer

City of Grand Forks

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February 6, 2018

Mr. Earl Haugen
Grand Forks/East Grand Forks MPO
255 N 4th St
Grand Forks, ND 58206

RE: Regional Road Program Applications

Dear Mr. Haugen:

Attached please find the City of Grand Forks' Regional Roads Program Applications for Fiscal Years 2018 through 2023. Please forward this application to NDDOT. If you have any questions or comments, please contact David Kuharenko at 701-746-2649.

Sincerely,

Allen R. Grasser, P.E.
City Engineer

ARG/djk

Cc: Mark Walker
David Kuharenko

PROJECT SCOPING WORKSHEET

DATE: 1/17/2017

PRIORITY: Secondary Regional request for an evaluation in 2018

City: Grand Forks Street: Bus US 81 (1st Ave N to 5th Ave S)

County: Grand Forks Length: ~1,000 ft

Proposed Improvement: Bus US 81/Washington St Railroad Underpass Structural Evaluation/Study

Cost Estimates Breakdown (in $1,000)							
Alternate	PE	R/W	Utility	Constr.	Bridges	Misc.	Total
					100		100

Present Road: Surface Width? (one direction) Surface Type? 9" Concrete with
29' Back of Curb to Back of Curb 1-1/2" Asphalt Overlay
32' Retaining Wall/Bridge Pier Face to Bridge Pier Face
On Street Parking Allowed? Present: No Proposed: No

Proposed Improvements

ADT Present: 24,780 Yr: 2013 Travel Way Width : 29' - 29'
ADT Design: 17,600 Design year: 2040 No. of Lanes: 4
Design Speed: 35 MPH Roadway Width:
Maximum Curve: Min. R/W Width: 95-151'
Maximum Grade: Depending on Retaining Wall or Sloped Sides Option

Right of Way

Will Additional ROW or easement be acquired? no ROW acquisition by: N/A
Has any ROW easements been acquired since 7-1-72: Unknown ROW Condemnation by:
Est. No. of occupied family dwelling to be displaced?
Est. No. business to be displaced?

Impacts

Will there be any additional Impacts (Cultural and Environmental Resources): No
Will there be any taking of any right-of-way from any public parkland (4F) or schools (6F): No
Airports: No Public Hearings:
Environmental Classification (Cat-Ex, EA, EIS): CED
Transportation Enhancements: Temporary lane closures likely during evaluation
Intermodal: Temporary lane closures likely during evaluation

Railroads Crossings						
RR Name	No. Xings	No. Tracks and Type of Crossing	Daily Train Movements	Train Speed	Present Protection	Proposed Protection
BNSF 081328B CASS LK-DL SW Washington St Underpass	1	3 Bridge	9	0-20MPH	Grade Separation	Same

Purpose and Need Statement For Regional Projects

1. According to the 2012 Washington St Corridor Study, "Concrete cores indicated the main cracking is result of ACR and to a lesser extent ASR. Damage from ACR and ASR is not reversible or repairable: the only long term corrective option is replacement of the affected elements of the structure. The bridge also exhibits deterioration in the superstructure and retaining walls typical of a bridge of this age.". According to the 2012 study, this pavement is reaching the end of its useful life. This evaluation is intended to provide an updated evaluation of the structure, an estimated timeline as to when work should be completed and updated cost estimates.

2. The railroad bridge was originally constructed in 1937 as two lanes wide and in 1964 was expanded to four lanes wide. BUS US 81/N Washington St was originally constructed in 1964 under NDDOT project F-FG-608(6). According to record drawings, the cross section was 9" of concrete pavement, on 3" of sand, on 36" of pit run gravel, on 6" of lime treated subgrade. In 1985 this section of road had a concrete grinding project, which according to the record drawings removed an average of ¼". In 2003 there was a project to overlay the concrete with 1-1/2" of Class 31 asphalt. In 2017 there was a project that milled and overlaid the pavement underneath the underpass from approximately Demers Ave to 2nd Ave N.

Additional information in regards to the proposed project may be found in the following pages, which are excerpts from the 2012 Washington St. Corridor Study.

Remarks:

City Engineer: Allan N Hruza Date: 1/17/18

District Engineer: Date: 1/18/18

Text not related to the Washington St Underpass

Recommendation: Replace the Existing BNSF Railway Underpass Structure and Adjacent Lift Station #183

Widespread cracking is present in the portion of the pier originally constructed in 1937. Concrete cores indicate the main cracking is result of ACR and to a lesser extent ASR. Damage from ACR and ASR is not reversible or reparable: the only long term correction option is replacement of the affected elements of the structure. The bridge also exhibits deterioration in the superstructure and retaining walls typical of a bridge of this age.

The pavement underneath the bridge structure was constructed in 1964 and is reaching the end of its useful life. Vertical clearance constraints underneath the BNSF Railway Bridge have reduced the potential improvement options underneath the bridge exclusively to pavement rehabilitation. Rehabilitation efforts improve deteriorated sections but do not prevent future deterioration concerns.

Full bridge replacement would alleviate any ASR and ACR issues within the bridge. Additionally, full bridge replacement would address all other concerns to the retaining walls and superstructure. Finally, during bridge replacement, the pavement underneath the bridge could be reconstructed.

Currently, the bridge has retaining walls on three of the four quadrants with a wing wall on the northwest side of the bridge. Sloped sections to the abutment may potentially reduce or eliminate the need for retaining walls. Sloped sections are potentially more aesthetically appealing and the open sides may be more attractive to pedestrian and bicycle activity. It is important to note the proposed grades required to tie in a bridge with sloped sides may create undesirably steep grades adjacent to the former City Detention Hospital, currently used as a multi-resident housing unit. To avoid possible negative impacts at this potentially historic building, a minor retaining wall adjacent to this building may be appropriate. Additionally, bridge replacement with retaining walls does offer cost and ROW benefits.

To balance aesthetic, multimodal, ROW and cost considerations, a combination of sloped sections and retaining walls may be appropriate. This balance would be developed during the environmental document phase of the project. A bridge with sloped sections can be reviewed on FIGURE 7.14 and 7.15 to conservatively highlight the bridge studied with the largest footprint and ROW requirements. FIGURE 7.14 illustrates a bridge with sloped sections, FIGURE 7.15 illustrates a bridge with a combination of sloped sections and retaining walls and FIGURES 7.16 and 7.17 illustrate the proposed bridge dimensions.

All three of the existing tracks would need to remain in service during construction. As a result, a shoo-fly bridge would need to be constructed to detour rail service around the bridge construction. Although the exact design ROW requirements necessary to construct a shoo-fly was beyond the scope of this report, potential impacts were estimated. The two most impactful shoo-fly options were conservatively studied. These options included a full north or south bypass structure. It is important to note that alternative shoo-fly options with reduced impacts may be possible. A shoo-fly routed to the north would potentially impact four (4) buildings. A shoo-fly to the south would impact one building and the railroad maintenance roundhouse. It is important to note that the grades present south of the underpass may limit the vertical clearance that can be provided under the shoo-fly bridge, restricting the size of vehicles that can use the route during construction.. Refer to 7.16 for a graphic illustration of the potential building impacts for a north and south shoo-fly.

Input received during consultation and coordination with representatives of BNSF Railway indicated that a north shoo-fly alignment will be problematic and may not be feasible. In order to provide rail service to the State Mill and Elevator and American Crystal Sugar, BNSF must be able to operate several switches in the vicinity of the bridge. BNSF representatives stated that the switching operation would not be feasible with the north alignment due to their operational requirements.

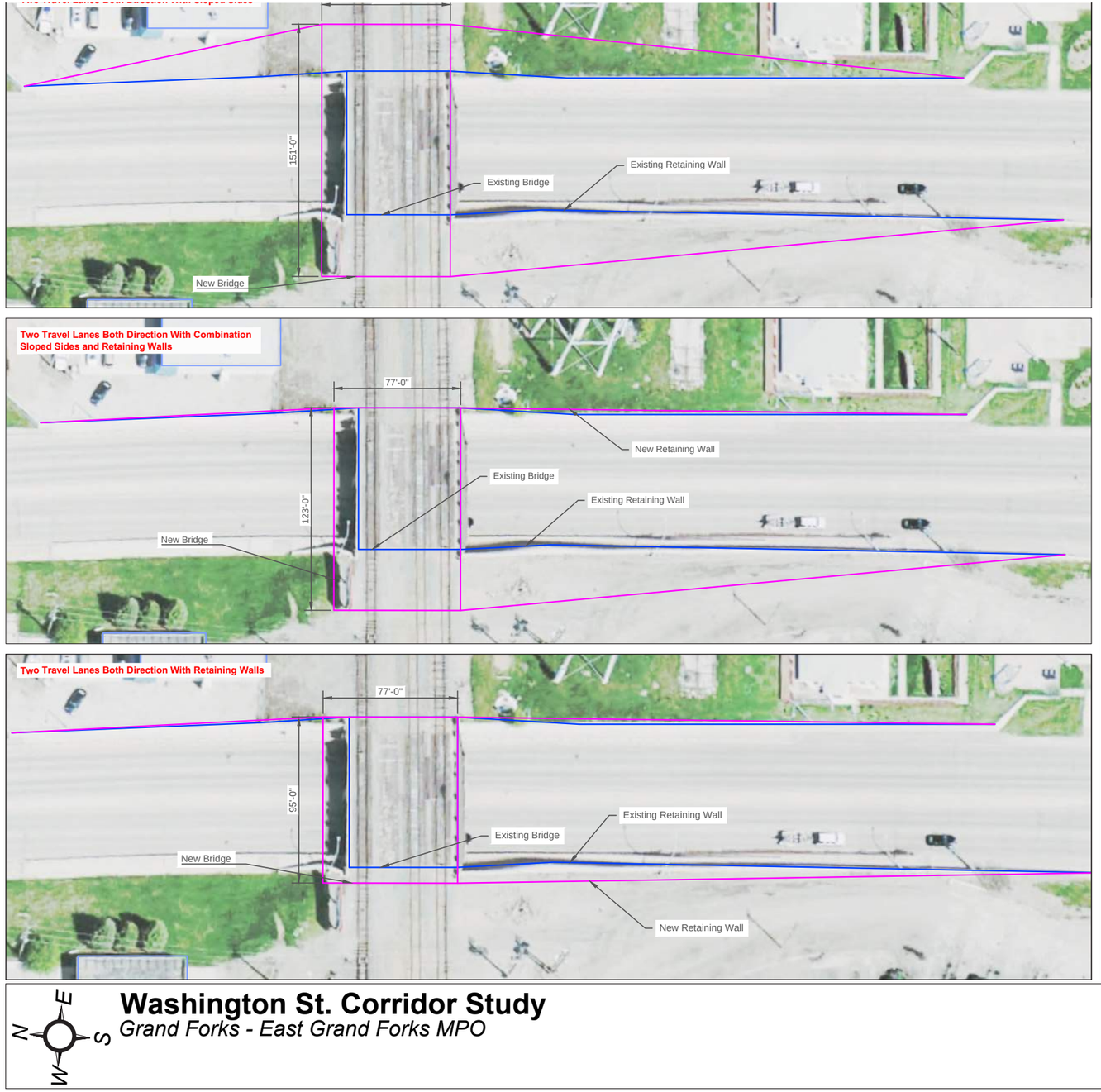
Lift station #183 is approximately three feet from the east BNSF Railway Bridge retaining wall and would need to be replaced and relocated upon bridge improvements. Storm water design calculations performed on the existing drainage area indicate that the existing pumps are sized with capacity for a five-year design storm. It is recommended that reconstruction of this lift station includes upgrades to handle a 25 year storm event to meet NDDOT design standards. Additionally, it is recommended the lift station be equipped with a grit chamber or sediment trap to increase the useful life the station's pumps.

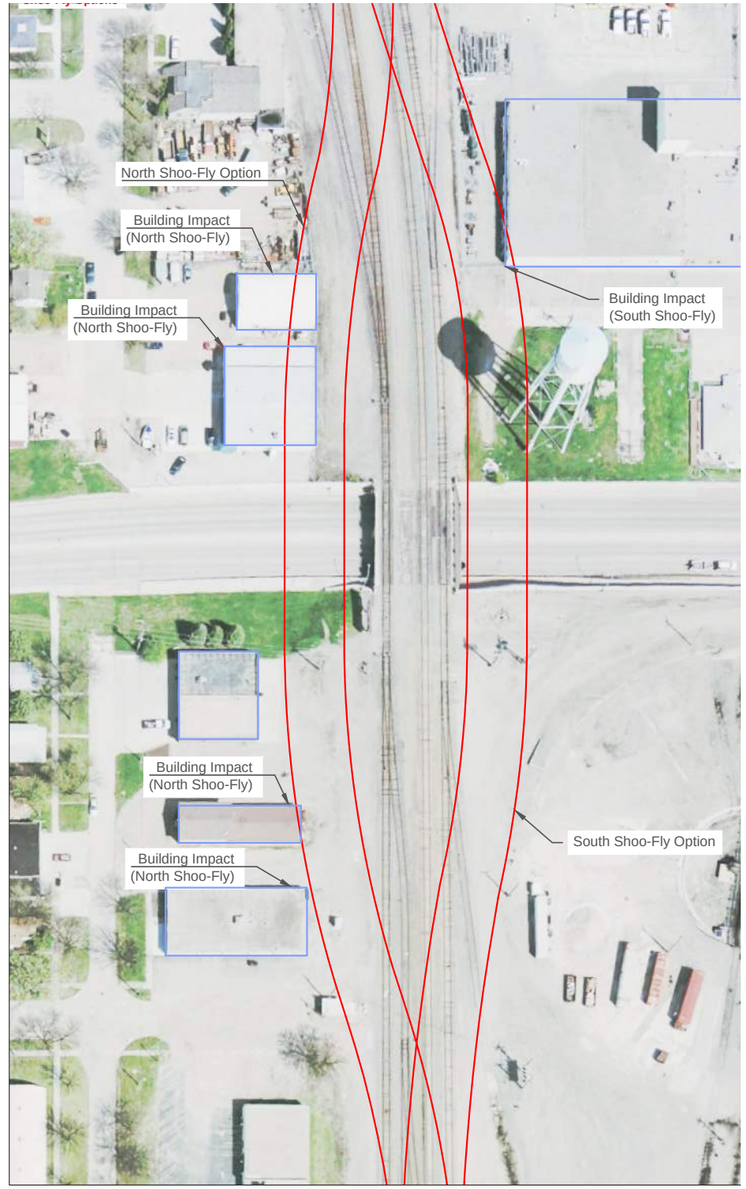
Note that bridge reconstruction should be coordinated with intersection design at the DeMers Avenue intersection to ensure adequate bridge clearance and that Washington Street gradelines are compatible. The DeMers Avenue intersection elevations may need to be modified to meet the desired bridge clearance and approach grades.

If the DeMers Avenue intersection improvements are not implemented, the southbound queue lengths would exceed the distance between the intersection and the bridge during the peak hour of the day. This scenario restricts turning vehicles from entering designated turn lanes. As a result, if the DeMers Avenue intersection improvements are not adopted and scheduled within a reasonable time after bridge reconstruction, it may be necessary to expand the bridge to include 4 southbound lanes to account for vehicle queues. Bridge expansion to include 2 additional southbound lanes would increase the cost of bridge by an estimated $4,000,000 in 2011 dollars. It is important to note that cost estimates that included this additional $4,000,000 was presented to the steering committee. Steering Committee feedback indicated that this additional cost may be impractical. This input was supported by the fact that other than at 17th Avenue South where frontage roads and medians are in place, no location was able to meet NDDOT turn lane length standards. As a result of the input and supporting analysis, this cost was not included in the implementation strategy for the corridor but should be revisited during project development.

FIGURE 7.14 – Proposed BNSF Railway Underpass Improvements (Sloped Section Alternative)

FIGURE 7.15 – Proposed BNSF Railway Underpass Improvements
(Sloped Sections/Retaining Wall Combination Alternative)





Bridge Replacement Options

FIGURE 7.16 – Bridge Replacement Options

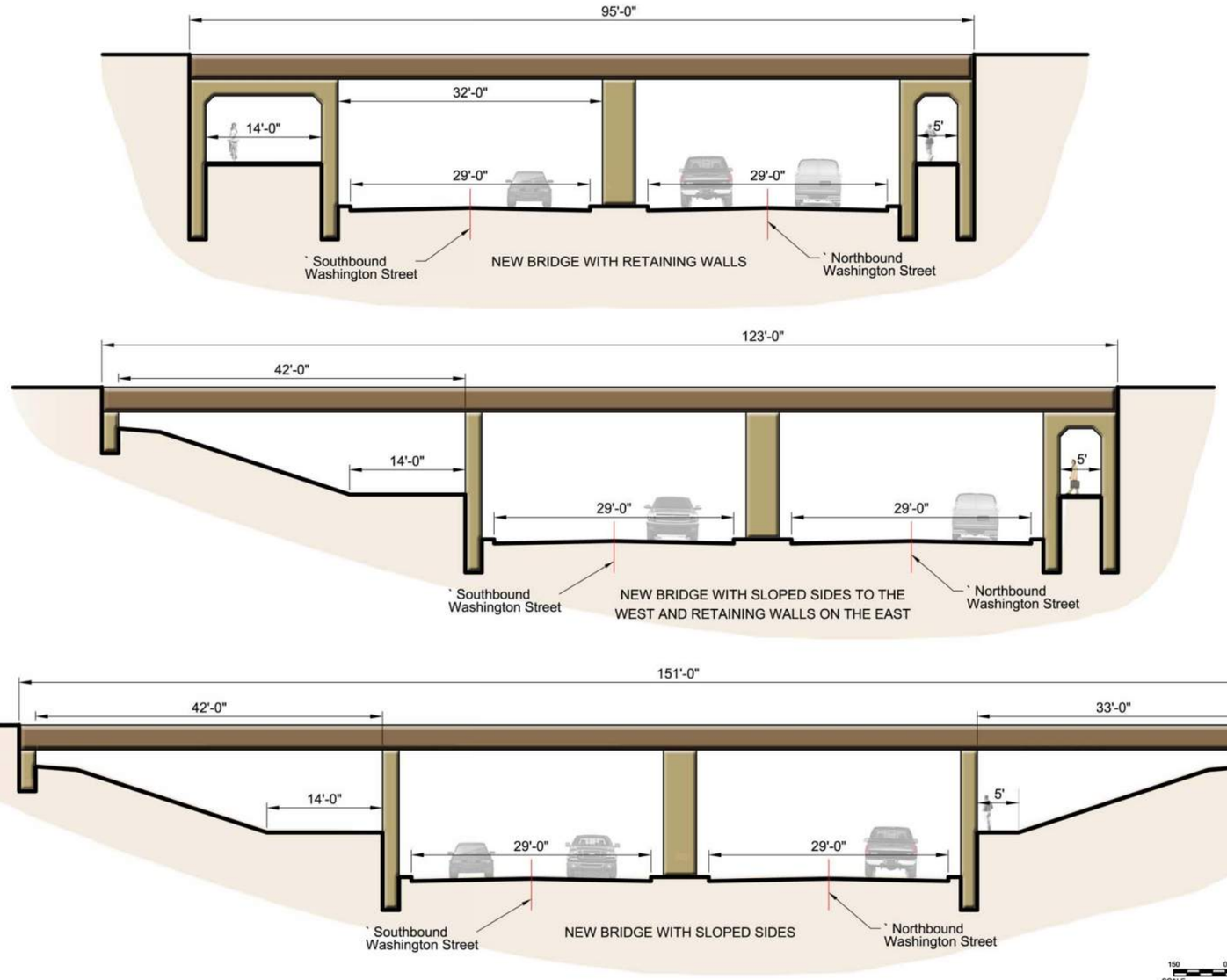


FIGURE 7.17 – Bridge Alternatives - Cross Sections

Discarded Alternative: Short-Term Bridge Repair

Short-term repairs and west bridge span replacement were considered during analysis. Short-term repairs include those measures necessary to ensure the continued functionality of the bridge for the next five years. However, to ensure functionality of the bridge beyond this time period, long-term repairs would need to be completed. As result, the alternative was discarded during analysis.

Discarded Alternative: Partial Bridge Replacement

A west bridge span replacement would include removal and replacement of the west bridge span in conjunction with concrete rehabilitation to the east span. With removal of the west span, the ASR and ACR issues would be removed. Cores from Braun Intertec do not indicate any ASR or ACR in the east span constructed in 1964. At some point in the future, the east span will need to be replaced at a time when the west span is still functional. Splitting the reconstruction into intermittent phases will double the frequency that traffic is impacted. Additionally, the overall cost of splitting the span replacements will be higher than replacing the entire bridge at once due to the cost of installing a shoo-fly required for each replacement. The cost of a shoo-fly was estimated at approximately 1.7 million dollars.

Discarded Alternative: Expand Bridge to Include Additional Lanes

Existing and forecasted 2035 corridor progression and capacity analysis indicated that the corridor is adequately served by the existing lane configuration underneath the bridge if DeMers Avenue intersection improvements are implemented. It is important to note that the design life of the bridge exceeds the study horizon for this project. It was beyond the project scope to consider traffic volumes beyond the year 2035. As a result, it may be appropriate to determine the specific bridge size and corresponding lane arrangement during the environmental project phase.

The southbound through-lane queue lengths at DeMers Avenue are anticipated to terminate approximately 40 feet from the bridge. To prevent queue blockage at the left and right-turn lane, it is recommended turn lanes be extended this distance. Based upon NDDOT design manual standards for turn-lanes, a 96 foot taper length is required from the end of the full-width turn-lane length. To accommodate for these taper lengths, the bridge would need to be extended by two-lane widths. It is important to note that no turn-lanes within the corridor meet NDDOT design standards due to the short block lengths. As a result, the cost associated with providing two additional lanes underneath the bridge to account for the adequate taper length distances was deemed an unnecessary luxury at this tightly constrained location. As such, the alternative was discarded.

Recommendation: Replace the Traffic Signal at 2nd Avenue North with Two-Way Stop Control

The intersection at 2nd Avenue North is not anticipated to meet traffic signal warrants throughout the study horizon. Analysis based upon procedures outlined in the FHWA publication User Guide For Removal of Not Needed Traffic Signals indicate the intersection may experience traffic operational and safety benefits from traffic signal removal. Analysis indicated upon traffic signal removal and two-way stop control installation on 2nd Avenue North, the location is anticipated to experience a reduction in crashes. Additionally, removal of the signal would eliminate any potentially unnecessary stops incurred by mainline Washington Street traffic. Eliminating unnecessary stops would reduce delay and fuel consumption and have minimal effects upon emissions at the intersection.

It is important to note several factors impact the traffic control signal removal decision other than analytical justification. Public opposition, as well as political and institutional considerations should be weighed against the technical findings provided in the report. If the decision is made to remove the candidate traffic control signal, guidelines outlined in the User Guide For Removal of Not Needed Traffic Signals should be followed. Refer to FIGURE 7.18 for a graphic illustration of this option.

Implementation Plan

Methodology

The purpose of this step is to provide the local jurisdictions with the necessary information to address the corridor transportation needs and guide the allocation and investment of transportation funds. This portion of the report identifies all project elements, includes programmatic cost estimates sufficient to include within local and regional Transportation Improvement Programs (TIP), evaluates options for funding sources and prepares a recommended priority-based schedule for implementation.

At the request of the MPO, City and NDDOT, a prioritization plan was identified first. This plan looks at the corridor in isolation and does not account for the transportation needs of the region as a whole and financial constraints resulting from funding other regional projects. The purpose of this plan is to provide decision makers with the necessary information required to make difficult and complicated short and long-term planning decisions.

First the corridor was segmented at logical termini (refer to FIGURE 8.1). Next, the corridor needs were identified to assist in project prioritization (refer to FIGURE 8.2). Corridor needs were tabulated in four categories: safety, infrastructure, multimodal and operational needs. These needs were subsequently rated. A rating of 5 corresponds to a need requiring urgent attention and a rating of 1 corresponds to a need that does not require immediate attention. It is important to note that the rating scale is relative to the perceived needs within the corridor exclusively. For example, a categorical rating of 1 is not to say that a specific corridor need is not essential, but implies that comparatively this improvement is not as urgent as other needs in this category at other locations within the corridor. The purpose of this rating scale is for ordering implementation strategies within the corridor and is not intended for comparative purposes beyond the study limits. Refer to TABLE 8.1 for results of the corridor needs assessment.

TABLE 8.1 – Corridor Needs Assessment

Corridor Segment	Safety	Infrastructure	Multimodal	Operations
8th Avenue to 1st Avenue North	2	3	5	1
1st Avenue North to 5th Avenue South	5	5	4	1
5th Avenue South to 7th Avenue South	5	1	4	5
7th Avenue South to Hammerling Avenue	3	3	5	3
Hammerling Avenue to 17th Avenue South	1	1	1	2

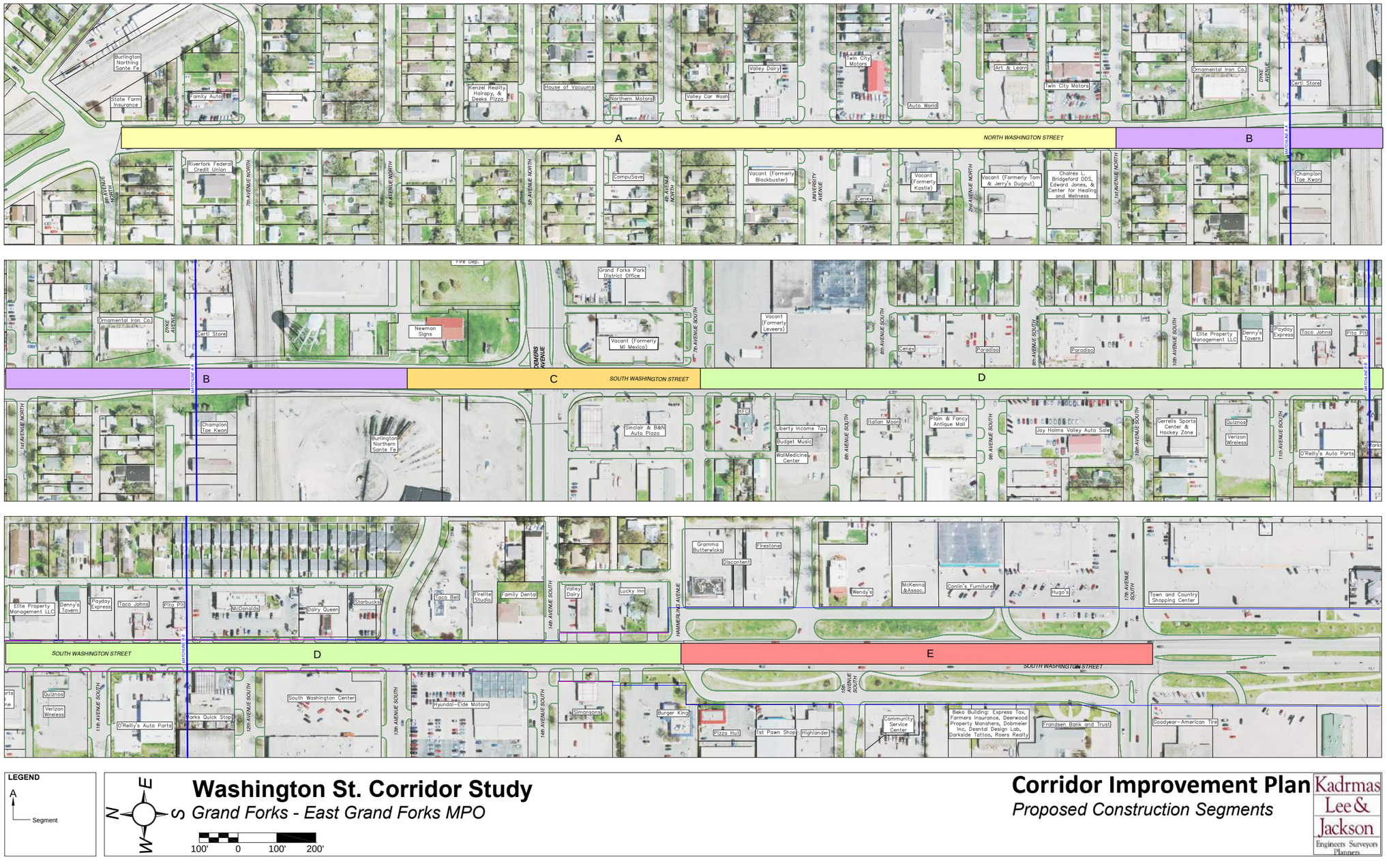


FIGURE 8.1 – Corridor Improvement Plan Proposed Construction Segments

Corridor Needs Matrix

Corridor Segment	Safety	Infrastructure	Multimodal	Traffic Operations
A. 8th Avenue North to 1st Avenue North	*WB approach of 8th Avenue North is approximately 50 feet from railroad tracks. This location meets Warrant 9 requirements for traffic signal installation. *3.7 crashes per year attributed to ingress or egress into private driveways. *NB and SB approaches of University Avenue each experienced 3 left-turn crashes.	* Pavement originally constructed in 1952 with structural overlays in 1970, 1985 and 2002.	*ADA side-slope standards are not met at the majority of driveways. *ADA clearance standards are not met around majority of street lights. *Sidewalks in need of rehabilitation at multiple locations. *No current bicycle accommodations.	*2nd Avenue North intersection does not meet MUTCD traffic signal warrants. Traffic operation benefits are anticipated upon conversion to two-way stop control.
B. 1st Avenue North to 5th Avenue South	*Bridge deterioration may lead to structural instability. *Bridge piers are within close proximity to driving lanes with no protection.	*West span of BNSF railroad bridge structure has irreversible conditions that leads to increased deterioration and an abbreviated useful life *Pavement was constructed in 1964 with no structural overlays since. *Storm sewer lift station #183 adjacent to the BNSF bridge structure is sized for 5 year event (NDDOT requires underpass lift stations to be sized for a 25 year event).	*Water leakage at BNSF bridge retaining wall can create icy sidewalks. *Narrow pedestrian/bicycle path under BNSF bridge structure does not meet AASHTO design standards for bicycles.	*Bridge rehabilitation offers potential to install conduit and fiber optic hardwire to interconnect north and south sides of City.
C. 5th Avenue South to 7th Avenue South	*15.3 rear-end crashes per year at DeMers Avenue intersection. *0.7 pedestrian or bicycle crashes per year at DeMers Avenue intersection. *1.7 SB to EB crashes per year at DeMers Avenue intersection. *1.7 crashes per year at 7th Avenue South intersection attributed to NB DeMers Avenue spillback conditions. *4th Avenue South on-ramp onto DeMers Avenue intersection (0.2 miles from DeMers Avenue intersection) identified as high crash location by NDDOT due to rear-end crash rate. *1.3 crashes per year attributed to ingress/egress into/out of private driveway.	*Pavement has varied sections. The section requiring the most immediate attention is between 5th Avenue South and DeMers Avenue which was constructed in 1964 with no structural overlays. *DeMers Avenue watermain trunk line is cast iron underneath Washington Street and should be replaced with PVC.	*ADA side-slope standards are not met at driveways. *Porkchop islands at DeMers Avenue intersection do not meet current AASHTO design standards. *No bicycle facilities south of DeMers Avenue.	*DeMers Avenue intersection operates at LOS "E" during existing peak-hour and is anticipated to operate at LOS "F" during forecasted peak hour. *NB DeMers Avenue Intersection traffic experiences spillback onto 7th Avenue South.
D. 7th Avenue South to Hammerling Avenue	*9.3 crashes per year attributed to ingress/egress into/out of private driveway. *1.7 crashes per year attributed to through or left-turn movements from the westbound approach of 10th Avenue South (10th Avenue South side-street approaches offset by approximately 100 feet).	*Pavement originally constructed in 1952 with structural overlays in 1974 and mill and overlays in 1985 and 2002.	*No traffic control other than a marked crosswalk at 9th Avenue South to allow pedestrians to cross Washington Street between DeMers Avenue and 13th Avenue South. *ADA side-slope standards are not met at majority of driveways. *Sidewalks in need of rehabilitation at multiple locations. *No current bicycle accommodations. *No bus turn-outs or transit patron amenities.	*The negatively offset intersection of 8th Avenue South (offset by approximately 120 feet) is anticipated to operate at LOS "E" during forecasted peak hour operation. *Negatively offset intersections at 9th, 10th, and 14th Avenues South cause operational issues.
E. Hammerling Avenue to 17th Avenue South		*Pavement was reconstructed in 1997.	*Includes bus turn-outs but does not include transit patron amenities.	*Forecasted 2035 SB 17th Avenue South through queue lengths exceed existing full-width turn-lane lengths. *The positively offset intersection of 15th Avenue South (offset by approximately 90 feet) is anticipated to operate at a LOS "F" during forecasted peak hour operation.

All crash data is from 1/1/2008 to 12/31/2010.

FIGURE 8.2 – Corridor Needs Matrix

During implementation planning, each corridor needs parameter was not weighted equally. First, improvements corresponding to safety in regards to minimizing crashes or potential infrastructure failures were considered. Next, infrastructure needs were considered due to the time sensitive nature of deterioration. Finally, multimodal and traffic operations were considered to promote efficient and convenient vehicular, pedestrian, bicycle and transit traffic flow.

Improvements that could be implemented without full roadway reconstruction were addressed as standalone projects. Standalone projects were much smaller in scope and magnitude than the entire corridor segment projects. As such, these projects were accompanied by much lower associated costs. The lower costs associated with these projects allow for implementation flexibility. Based upon the varying degree of funding, planning and project development between standalone and large-scale reconstruction projects, unique prioritization lists was developed for each. Similar methodology was utilized to develop the standalone project prioritization list. For example, the 2nd Avenue North signal replacement with two-way stop control was the first project prioritized due to the anticipated improvements to crash rates and traffic operations compounded by the inherent long-term cost benefits of the project. Implementing this project first may result in signal maintenance and operation cost savings that could subsequently help pay for other projects in the future.

It is important to note that the implementation plan assumes proper maintenance of the existing and proposed infrastructure including seal coats, structural overlays, concrete pavement repair, restriping, sign maintenance, signal timing modifications, etc. Roadway maintenance requirements may spur project development in an order that disagrees with the following plan. Refer to TABLES 8.2 and 8.3 for details regarding the corridor-specific prioritization plan.

Implementation Plan

TABLE 8.2 – Full Reconstruction Project Priority

Year	Implementation Plan with Regional Considerations	Planning Term	Programming Cost (1st Year of Term)	Programming Cost (Mid-Term Year)	Programming Cost (Last Year of Term)
2016	32nd Avenue South to Hammerling Avenue Preventive Maintenance[1]	Mid-Term 2016-2022	$2,281,224 Federal $1,824,979 State $228,122 Local $228,122	$2,566,067 Federal $2,052,854 State $256,607 Local $256,607	$2,886,476 Federal $2,309,181 State $288,648 Local $288,648
	1st Avenue North to 5th Avenue South Full Reconstruct (Include Underpass Improvements)[2]	Mid-Term 2016-2022	$14,466,859 Federal $11,573,487 State $1,446,686 Local $1,446,686	$16,273,248 Federal $13,018,599 State $1,627,325 Local $1,627,325	$18,305,191 Federal $14,644,153 State $1,830,519 Local $1,830,519
	Alternate Bicycle Route Adjacent to Corridor[3]	Mid-Term 2016-2022	$210,286 Federal $168,229 State $21,029 Local $21,029	$236,543 Federal $189,234 State $23,654 Local $23,654	$266,079 Federal $212,863 State $26,608 Local $26,608
	8th Avenue North to 1st Avenue North Full Reconstruct	Long-Term 2023-2035	$8,017,637 Federal $6,414,110 State $801,764 Local $801,764	$10,144,869 Federal $8,115,895 State $1,014,487 Local $1,014,487	$12,836,495 Federal $10,269,196 State $1,283,650 Local $1,283,650
	7th Avenue South to Hammerling Avenue Full Reconstruct	Long-Term 2023-2035	$10,336,000 Federal $8,268,800 State $1,033,600 Local $1,033,600	$13,078,337 Federal $10,462,670 State $1,307,834 Local $1,307,834	$16,548,269 Federal $13,238,615 State $1,654,827 Local $1,654,827
	Alternate Bicycle Route Adjacent to Corridor[2]	Long-Term 2023-2035	$276,722 Federal $221,378 State $27,672 Local $27,672	$350,142 Federal $280,114 State $35,014 Local $35,014	$443,041 Federal $354,433 State $44,304 Local $44,304
	Traffic Signal Fiber Optic Interconnect	Long-Term 2023-2035	$1,097,052 Federal $877,642 State $109,705 Local $109,705	$1,388,121 Federal $1,110,497 State $138,812 Local $138,812	$1,756,416 Federal $1,405,133 State $175,642 Local $175,642
	5th Avenue South to 7th Avenue South Full Reconstruct (Include DeMers Avenue Intersection Improvements)	Long-Term 2023-2035	$18,758,124 Federal $15,006,499 State $1,875,812 Local $1,875,812	$23,735,011 Federal $18,988,009 State $2,373,501 Local $2,373,501	$30,032,361 Federal $24,025,889 State $3,003,236 Local $3,003,236
2035	2nd Avenue North Intersection Signal Replacement with Two-Way Stop Control, 8th Avenue North Traffic Signal Installation, University Avenue Northbound and Southbound Left-Turn Improvements, 15th Avenue South Right Turn-Lane Installation & 17th Avenue South Turn-Lane Modifications	Part of Another Priority	Part of Another Priority	Part of Another Priority	Part of Another Priority

[1]The majority of this project is beyond the project limits and scope of this study. This cost represents an NDDOT estimate and is not included in the Appendix.
[2]Cost conservatively represents the highest cost bridge alternative. This alternative includes full bridge replacement with sloped sections.
[3]Cost assumes that roadway widening is not required to implement an alternate bicycle route adjacent to the corridor. Additionally the cost assumes that the pedestrian beacon at the intersection of North 15th Sreet and University is relocated to the North 14th Street and University. This improvement is pending Winship Elementary School acceptance

Setup Scoring Categories & Factors

Score System: Regional Urban Roads - ND Max. Score: 100

Go Back

Adjust Scoring Categories

(Use TAB key to navigate.)

	Category	Description	Weights		Points		
1	Economic Vitality	Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.	10	%	10	pts	Delete
2	Security	Increase security of the transportation system for motorized and nonmotorized uses.	5	%	5	pts	Delete
3	Accessibility and Mobility	Increase the accessibility and mobility options to people and freight.	15	%	15	pts	Delete
4	Environmental/Energy/QOL	Protect and enhance the environment, promote energy conservation,and improve quality of life.	10	%	10	pts	Delete
5	Integration and Connectivity	Enhance the integration and connectivity of the transportation system across and between modes for people and freight.	10	%	10	pts	Delete
6	Efficient System Management	Promote efficient system management and operation.	5	%	5	pts	Delete
7	System Preservation	Emphasize the preservation of the existing transportation system.	20	%	20	pts	Delete
8	Safety	Increase safety of the transportation system for motorized and nonmotorized uses.	15	%	15	pts	Delete
9	Local/Regional Factors	Factors of local or regional importance	10	%	10	pts	Delete
		TOTAL	100	**%**	100	**pts**	

Add New Category

			Add

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	BUS 81/Washington St Railroad Underpass Structural Evaluation Study - 2018

Category 1 Economic Vitality		
Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.		Assign score 0 or 1
A	Consistent with local, regional or state econimic development plans	0
B	Work located on identified truck route or identified in Freight Study	1
C	Provides new access to jobs and opportunities	0
D	Improves connection to terminal (sea, air, multimodal) on the last mile or two ac	0

Category 2 Security		
Increase security of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Install equipment that monitors the security of the transportation infrastructure	0
B	Consistent with regional emergency/security/hazardous materials movement.	0
C	Coordinates/improves Bridge Closure Management Plan	0
D	Coordinates/improves Special Events Management Plans	0

Category 3 Accessibility and Mobility		
Increase the accessibility and mobility options to people and freight.		Assign score 0 or 1
A	Provides accepatble LOS for facility as recommended in LRTP	0
B	Consistent with access control regulations	0
C	Enhances accessibility and mobility for all modes	0
D	Address LOS deficiency not resolved by another planned project	0
E	Enhances the range of freight service options available to area businesses	0

Category 4 Environmental/Energy/QOL		
Protect and enhance the environment, promote energy conservation,and improve quality of life.		Assign score 0 or 1
A	Demonstrates core context sensitive solutions principles	0
B	Addresses EJ analysis process	0
C	Decreases fuel consumption which reduces greenhouse gas	0
D	Avoids or minimize impacts to wetlands or other natural habitats	1
E	Incoporates innovative stormwater management techniques	0
F	Promotes nonmotorized travel	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name BUS 81/Washington St Railroad Underpass Structural Evaluation Study - 2018

Category 5 Integration and Connectivity		
Enhance the integration and connectivity of the transportation system across and between modes for people and freight.		**Assign score 0 or 1**
A	Reduces excessive travel delays	0
B	Improves direct travel trips between states	0
C	Address last segment/link of corridor	0
D	Improves the integration/connectivity of whole transportation system	0
E	On Regional Primary Road	0

Category 6 Efficient System Management		
Promote efficient system management and operation.		**Assign score 0 or 1**
A	Incorporates elements from ITS Strategic Plan	0
B	Improving operations without adding through capacity	0
C	Enhances interoperability amoung modal equipment/technologies	0
D	Contributes to better collecting traffic data	0

Category 7 System Preservation		
Emphasize the preservation of the existing transportation system.		**Assign score 0 or 1**
A	Utilize pavement management system results	0
B	Emphasizes system rehabilitation rather than expansion	0
C	Incorporates technologies new to the MPO area	0
D	Maximizes existing capacity	0
e	Contributes to better system maintenance	0

Category 8 Safety		
Increase safety of the transportation system for motorized and nonmotorized uses.		**Assign score 0 or 1**
A	Address locations identified as high crash locations in LRTP, coridor studies, hi	0
B	Enhances safe route to school route	0
C	Consistent with Strategic Highway Safety Plan	0
D	Improves points of conflict	0
E	Enhances the public safety of nonmotorized users	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name BUS 81/Washington St Railroad Underpass Structural Evaluation Study - 2018

Category 9 Local/Regional Factors		
Factors of local or regional importance		**Assign score 0 or 1**
A	Conformance with regional or state plan	0
B	Demonstrates analysis of project risk in implementation	1
C	Provides benefit for multiple transportation agencies	1
D	Advances smart growth objectives	0

PROJECT SCOPING WORKSHEET

DATE: 1/17/2017

PRIORITY: Interstate system I-29 NEPA Document in 2020

City: Grand Forks Street: I-29 near 47th Ave S

County: Grand Forks Length: ~1 mile

Proposed Improvement: Completion of NEPA Documentation to address congestion and level of service on Bus US 81/32nd Ave S with the construction of a new interchange bridge, approaches and ramps at 47th Ave S.

Cost Estimates Breakdown (in $1,000)							
Alternate	PE	R/W	Utility	Constr.	Bridges	Misc.	Total
						2,000	2,000

Present Road: Surface Width? 4 lane divided Surface Type? Concrete

On Street Parking Allowed? Present: No Proposed: No

Proposed Improvements

ADT Present: I-29 12,515 - 47th Ave S 2,830 -32nd Ave S 15,325 Yr: 2015
ADT Design: I-29 23,735 - 47th Ave S 17,975 - 32nd Ave S 25,890 Yr: 2040
Travel Way Width : No. of Lanes: 4 & 2
Design Speed: 40 MPH (urban) & 70MPH Interstate Roadway Width: 12 foot lanes
Maximum Curve: Min. R/W Width:
Maximum Grade:

Right of Way

Will Additional ROW or easement be acquired? Yes ROW acquisition by: NDDOT
Has any ROW easements been acquired since 7-1-72: Unknown ROW Condemnation by:
Est. No. of occupied family dwelling to be displaced? None
Est. No. business to be displaced? None

Impacts

Will there be any additional Impacts (Cultural and Environmental Resources): No
Will there be any taking of any right-of-way from any public parkland (4F) or schools (6F): No
Airports: No Public Hearings: Maybe
Environmental Classification (Cat-Ex, EA, EIS): Cat-Ex or EA
Transportation Enhancements: Decreased traffic volume and congestion at 32nd Ave S, improved Level of Service for intersections on Bus US 81/32nd Ave S. This also significantly reduced the number of vehicle miles traveled and vehicle hours traveled compared to a no build
Intermodal: Shared use path on overpass bridge

Railroads Crossings						
RR Name	No. Xings	No. Tracks and Type of Crossing	Daily Train Movements	Train Speed	Present Protection	Proposed Protection
None						

Purpose and Need Statement For Regional Projects

I-29 was originally constructed around 1968, at the time of its construction four interchanges were constructed in or around the city of Grand Forks. These interchanges included: N Washington St, Gateway Dr/US 2, Demers Ave (ND SH 297), and 32nd Ave S/Bus US 81. These interchanges have been in place for nearly 50 years, with no additional interchanges being built within the city limits. There are also two overpasses located at University Ave and at Merrifield Rd/County Rd 6. Over that time the City of Grand Forks has grown from a population of approximately 39,000 to approximately 57,000. Though the city of Grand Forks has grown, the city's growth has been dense with a population density of 2,723/sq mi. Grand Forks' population density exceeds other similar cities within North Dakota:, Fargo – 2,318/sq mi, Bismarck - 2,034/sq mi, West Fargo - 1,924/sq mi, Minot – 1,719/sq mi, Williston – 1,083/sq mi[1].

With the increased population of Grand Forks, comes increase transportation needs, and associated traffic congestion on the existing infrastructure. In the summer of 2017 an I-29 Traffic Operations Report was completed looking at the I-29 corridor around the city. This report noted numerous times that the projected traffic volumes at the most southern existing interchange located at US Bus 81/32nd Ave S would have extreme levels of congestion, traffic cuing onto the interstate, and nearby intersections operating at a level of service F by 2025. This study looked at multiple aspects to prevent these issues from occurring in the future. This included, looking at non interstate improvements to encourage local traffic to use existing arterial roadways, improvements to the existing interchanges, and construction of new interchanges.

The study first looked at non-interstate improvements to encourage local traffic to use the existing arterial roadway system and reduce the traffic using the interstate. This included widening existing north-south arterial roadways such as 42nd St and Columbia Rd, improving some intersections including a continuous flow intersection, as well as adding dual left turn lanes, and realigning roadways to have better accessibility. The results of this scenario showed that these projects did not reduce demand onto I-29, and in some cases actually increased the volume of traffic onto I-29.

1. http://www.towncharts.com/North-Dakota/Top-25-Cities-in-North-Dakota-ranked-by-Population-Density.html

Another aspect which was explored was improvements to the interchange at 32nd Ave S/Bus US 81. Some of these alternatives included widening 32nd Ave S/Bus US 81, consolidating the east ramp, adding a northwest loop ramp, adding a southwest loop ramp, reconstructing the interchange to a diverging diamond interchange, and a diverging diamond with a partial cloverleaf. Of the available alternatives, only in two scenarios could 95% of the PM peak volumes in 2040 could be processed. In the summary of these alternatives the study states "**None of the alternatives studied under the Existing Interstate Access Scenario, without a 47th Avenue interchange, meet the established [Purpose and Needs] because they cannot improve operations to an acceptable level.**"

This report also evaluated the 32nd Ave S/Bus US 81 interchange with a new interchange constructed at 47th Ave S. By constructing a new interchange at 47th Ave S, traffic volumes on 32nd Ave S/Bus US 81 are forecasted to be reduced by approximately 40%. Evaluating available alternatives under this scenario 32nd Ave S/Bus US 81 could utilize the least expensive option of "Spot Improvements" and would be able to support anticipated traffic volumes and intersections are forecasted to operate at LOS D or better.

The proposed project for this NEPA document is to construct a new interchange on I-29 and connect to 47th Ave S to address the congestion and level of service issues on Bus US 81/32nd Ave S. The report identified a number of alternatives for consideration for this interchange.

Remarks:

City Engineer: _____ Date: 1/17/18

District Engineer: _____ Date: 1/18/18

1. http://www.towncharts.com/North-Dakota/Top-25-Cities-in-North-Dakota-ranked-by-Population-Density.html

Project: I-29 and 47th Ave S Interchange
Environmental Document
1/25/2018

Estimated Cost	$2,000,000	
Proposed Cost Share		
Federal	40%	$800,000
State	10%	$200,000
Local	50%	$1,000,000
Total	100%	$2,000,000

32nd Avenue/US 81B

32nd Avenue/US 81B serves a large majority of commercial activity in Grand Forks. Daily traffic volumes from 2015 along this corridor range from approximately 11,300 vehicles per day west of I-29 to 16,300 vehicles per day east of I-29. The areas surrounding I-29 at 32nd Avenue/US 81B and heading south to 47th Avenue are forecasted to be the largest population and employment growth centers in the city. Specifically, 58 percent of new employment opportunities are expected to occur within one-mile of either the 32nd Avenue/US 81B interchange or the 47th Avenue corridor. By 2040, this amount of growth is expected to result in traffic volumes around 43,000 vehicles per day east of I-29 and 23,000 vehicles per day west of I-29. This results in oversaturated interchange operations, producing long delays and queues by 2040.

Analysis completed for the Macro Level Alternatives Analysis found that the construction of a 47th Avenue interchange would have significant tangible benefits to the 32nd Avenue/US 81B interchange, potentially mitigating the need for costly widening at I-29 east to Columbia Road. The 32nd Avenue/US 81B intersection would experience more than 40 percent traffic reduction under this scenario, where other interchanges experienced far less. This necessitated a need to evaluate different interchange scenarios with and without the 47th Avenue interchange. Alternatives were analyzed under the Existing Interstate Access Scenario (no 47th Avenue interchange), which assumes a six-lane section on 32nd Avenue/US 81B, and the 47th Avenue Interchange Scenario, which assumes a four-lane section on 32nd Avenue/US 81B.

The Merrifield Road/CR 6 Interchange Infrastructure will also be considered later in this chapter but had minimal impacts to the overall operations of 32nd Avenue/US 81B. The combination of the 47th Avenue Interchange and the Merrifield Road/CR 6 Interchange provided similar benefits to 32nd Avenue/US 81B as the 47th Avenue interchange in isolation.

ANALYSIS METHODOLOGY

Analysis for this interchange location used the Value Planning approach detailed previously in this report.

INTERCHANGE ALTERNATIVES

EXISTING INTERSTATE ACCESS SCENARIO

As described above, this scenario does not include any additional interchange infrastructure. This means the future development expected in the southwest metro will be funneled to the 32nd Avenue/US 81B corridor for access onto and across the interstate.

Widen Only Alternative

The Widen Only Alternative (WO) would add one through lane in each direction on 32nd Avenue/US 81B from the 42nd Street west frontage road to east of 38th Street, as well as traffic control at the 42nd Street west frontage road and turn lanes at all four study intersections which would require bridge widening. The WO alternative is treated as the baseline for comparisons against other alternative designs; the true do nothing alternative model broke down and could not accurately replicate queues and delay.

Even with the additional capacity, this alternative was unable to be properly calibrated during the 2040 P.M. peak, with 15.2 percent latent demand. This means more than 1,500 vehicles did not enter the model so their delay has not been incorporated into the overall network delay and is not acceptable for analysis.

Based on the traffic the model could process, long queues, in excess of 1,000 feet are expected at all four study intersections. Levels of service are deficient at all study intersections, excluding the East Ramp intersection. It is important to note that the queues extending onto I-29 are likely not being incorporated into the East Ramp delay.

The estimated cost for this alternative was $7.7 million which only included widening the bridge and the difference between reconstructing 32nd Avenue/US 81B as a four-lane section and reconstructing and widening as a six-lane section. This planning level cost should be further refined but was used as a baseline cost. Value planning scores for this alternative can be seen in Table 7-17.

Table 7-17: 32nd Avenue/US 81B Widen Only Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	▪ A.M. Peak Average: 57.1, LOS "E" ▪ P.M. Peak Average: 92.2, LOS "F"	0*
Mainline Operations	▪ Average A.M. Peak: 12.8, LOS "B" ▪ Average P.M. Peak: 94.4 LOS "F"	0*
Environmental Impacts	▪ No additional environmental impacts expected.	8
Safety	▪ Baseline crash potential distribution for alternative comparison: » 6.5% Crossing Crash Potential » 62.5% Rear End Crash Potential » 31.0% Sideswipe Crash Potential	9
Cost	▪ $7.7 Million**	10
Total		27

*Score of zero assigned because model could not be calibrated. Not all delay considered.
**Includes planning level costs on a per mile basis.

Consolidated East Ramp

The Consolidated East Ramp (CER) Alternative would add a through lane in each direction as well as realign 42nd Street east of I-29 with the East Ramp. This helps split southbound traffic at 38th Street, a major bottleneck along the corridor. This alternative also incorporates double left turn lanes at 38th Street, a northbound right turn lane, westbound left and a traffic control signal at the 42nd Street west frontage road. It requires bridge widening. This alternative also incorporates two loops in the southeast and southwest quadrants, which helps eliminate crossing conflicts and improves operational efficiency by allowing a two-phase signal controller.

This alternative had 4.7 percent latent demand during the 2040 P.M. peak, which is acceptable for calibration according to FHWA standards. During the 2040 P.M. peak, operations at 42nd Street frontage road and 38th Street are deficient at LOS "E", while the two ramp intersections operate at LOS "D"; delays at the ramp intersections produce long queues onto the interstate. There are no operational concerns during the 2040 A.M. peak hour.

This alternative reduces crossing crash potential by 24.1 percent and rear-end potential by 49.0 percent when compared against the WO alternative. Sideswipe crash potential is increased by 188.6 percent when compared against the Widen Only alternative.

Value planning scores for this alternative can be seen in Table 7-18 with planning level design layout in Figure 7-26.

Table 7-18: 32nd Avenue/US 81B Consolidated East Ramp Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	» A.M. Peak Average: 18.1, LOS "A" » P.M. Peak Average: 62.0, LOS "E "	5
Mainline Operations	» Average A.M. Peak: 11.92, LOS "B" » Average P.M. Peak: 55.1 LOS "F"	4
Environmental Impacts	» No significant new environmental impacts. 3.5 acres of ROW required.	6
Safety	26.2% increase in crash potential when compared against Widen Only Alternative » 24.1% Reduction in Crossing Crash Potential » 49.0% Reduction in Rear End Crash Potential » 188.6% Increase in Sideswipe Crash Potential	0
Cost	» $30.9 Million	0
Total		15

Northwest Loop Ramp

The Northwest Loop Ramp (NWL) Alternative incorporates a northwest loop on-ramp for westbound to southbound movements, turn lanes at adjacent intersections and traffic control at the 42nd Street west frontage road. This alternative requires widening the 32nd Avenue/US 82B bridge to accommodate additional through lanes. Due to the posted speeds and the ROW constraints, only a small radius could be constructed. This requires parallel merge lanes to ensure safe and efficient merging.

This alternative had 10.0 percent latent demand during the 2040 P.M. peak, which is not acceptable for calibration according to FHWA standards. Nearly 1,000 vehicles were unable to enter the network during the 2040 P.M. peak. However, based on the vehicles processed, the 42nd Street west frontage roads and 38th Street intersections were deficient at LOS "F" with the ramp intersections operating at LOS "E". Queues at the ramp intersection extend onto the interstate, completely blocking all through lanes.

During the 2040 A.M. peak, only the 38th Street intersection is deficient at LOS "E". There are no queueing concerns.

Value planning scores for this alternative can be seen in Table 7-19 with planning level design layout in Figure 7-27.

Table 7-19: 32nd Avenue/US 81B Northwest Loop Ramp Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	» A.M. Peak Average: 39.1, LOS "D" » P.M. Peak Average: 99.4, LOS "F"	0*
Mainline Operations	» Average A.M. Peak: 13.3, LOS "B" » Average P.M. Peak: 54.4, LOS "F"	0*
Environmental Impacts	» No significant environmental impacts. Two acres of ROW required and some access revisions.	6
Safety	14.8% increase in crash potential when compared against Widen Only Alternative » 128.2% Increase in Crossing Crash Potential » 16.4% Reduction in Rear End Crash Potential » 53.6% Increase in Sideswipe Crash Potential	4
Cost	» $27.8 Million	1
Total		11

*Score of zero assigned because model not calibrated. Not all delay considered.

Southwest Loop Ramp

The Southwest Loop Ramp (SWL) Alternative incorporates a southwest loop off-ramp for southbound to eastbound movements, turn lanes at adjacent intersections and traffic control at 44th Street. This alternative requires widening the 32nd Avenue/US 81B bridge to accommodate additional through lanes and access revisions to the 42nd Street west frontage road which allowed for a RIRO access on the northside of 32nd Avenue/US 81B but closed the access on the southside.

This alternative had 3.1 percent latent demand during the 2040 P.M. peak, which is acceptable for calibration according to FHWA standards. During the 2040 P.M. peak, operations at the East Ramp are deficient at LOS "E" with queues that extend onto the interstate. The 38th Street and 44th Street intersections are deficient at LOS "F" and LOS "E" respectively. The 44th Street intersection would be improved with a double left-turn lane. However, that would require two receiving lanes which would have building impacts. At this time, a single left-turn lane was analyzed.

During the 2040 A.M. peak, all intersections operate at LOS "C" or better except the 38th Street intersection which operates at LOS "E". There are no queueing concerns at the ramp intersections.

The SWL Alternative reduces crossing crash potential by 42.1 percent and rear-end crash potential by 40.2 percent. Sideswipe crash potential is increased 88.3 percent.

Value planning scores for this alternative can be seen in Table 7-20 with planning level design layout in Figure 7-28.

Table 7-20: 32nd Avenue/US 81B Southwest Loop Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	» A.M. Peak Average: 27.9, LOS "C" » P.M. Peak Average: 57.6, LOS "E"	5
Mainline Operations	» Average A.M. Peak: 13.2, LOS "B" » Average P.M. Peak: 23.9, LOS "D"	7
Environmental Impacts	» No significant environmental impacts. Two acres of ROW required and some access revisions.	6
Safety	0.5% decrease in crash potential when compared against Widen Only Alternative » 42.1% Reduction in Crossing Crash Potential » 40.2% Reduction in Rear End Crash Potential » 88.3% Increase in Sideswipe Crash Potential	10
Cost	» $23.5 Million	5
Total		33

Diverging Diamond Interchange

The Diverging Diamond Interchange (DDI) Alternative requires the two directions of traffic on 32nd Avenue/US 81B to cross to the opposite side of the road under the I-29 bridge. This allows left-turning and right-turning traffic to perform a free flow movement onto the interstate on-ramp. The free-flowing movements reduce the signal phases to two at each intersection, significantly reducing delays. The right-turn slip ramp on the southbound I-29 on-ramp requires access management at the 42nd Street west frontage road. This alternative requires widening the 32nd Avenue/US 81B bridge to accommodate additional through lanes. A backage road was configured with a signal incorporated at 44th Street.

This alternative had 6.0 percent latent demand during the 2040 P.M. peak, which is not acceptable for calibration according to FHWA standards. More than 600 vehicles were unable to enter the network during the 2040 P.M. peak. However, based on the vehicles processed, the West Ramp intersection and 38th Street intersection were deficient with LOS "E" during the 2040 P.M. peak. Queues at the West Ramp and East Ramp extend back onto the interstate. During the 2040 A.M. peak all intersections operate at LOS "D" or better with no queuing concerns. The DDI alternative increases crossing crash potential by 23.7 percent and sideswipe crash potential by 18.0 percent but decreases rear end crash potential by 9.4 percent.

Value planning scores for this alternative can be seen in Table 7-21: 32nd Avenue/US 81B Diverging Diamond Interchange Alternative (Existing Interstate Access Scenario)with planning level design layout in Figure 7-29.

Table 7-21: 32nd Avenue/US 81B Diverging Diamond Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	» A.M. Peak Average: 23.2, LOS "C" » P.M. Peak Average: 50.8, LOS "D"	0*
Mainline Operations	» Average A.M. Peak: 13.3, LOS "B" » Average P.M. Peak: 77.0, LOS "F"	0*
Environmental Impacts	» No significant environmental impacts. Two acres of ROW required and some access revisions.	6
Safety	1.3% increase in crash potential when compared against Widen Only Alternative » 23.7% Increase in Crossing Crash Potential » 9.4% Reduction in Rear End Crash Potential » 18.0% Increase in Sideswipe Crash Potential	9
Cost	» $22.1 Million	6
Total		21

*Score of zero assigned because model not calibrated. Not all delay considered.

Diverging Diamond Partial Cloverleaf

Additional analysis was completed for the 2040 P.M. peak hour using a diverging diamond partial cloverleaf design, shown in Figure 7-23. This uses a diverging diamond interchange concept with bypass lanes to a northwest loop ramp and southeast loop ramp. It would require access control at the 42nd Street west frontage road, double left-turn lanes on all approaches at 38th Street and would require significant bridge widening. This design has similar free flow movements and signal phase efficiency as the DDI alternative.

This alternative was only analyzed under the 2040 P.M. peak hour to determine if further analysis should be completed. With 4.7 percent latent demand it was technically calibrated. However, the 44th Street and 38th Street intersections were still deficient and queueing onto I-29 still occurred. Since this alternative did not have acceptable operations, no further analysis was completed.

Figure 7-23: Diverging Diamond Partial Cloverleaf Alternative (Existing Interstate Access Scenario)

Summary of Alternatives Under Existing Interstate Access Scenario

The growth areas planned for the southwest metro result in more than 160 percent growth on 32nd Avenue/US 81B as this corridor is the only access across and onto I-29. This growth results in extreme congestion, to an extent where three of the five alternatives (WO, NWL, DDI) analyzed cannot process at least 95 percent or more of projected 2040 P.M. peak hour traffic, resulting in the inability to properly calibrate the alternatives. The remaining two alternatives that meet calibration standards do not meet local or mainline operations standards, with deficient intersection operations and queues onto the interstate. **None of the alternatives studied under the Existing Interstate Access Scenario, without a 47th Avenue interchange, meet the established PNS because they cannot improve operations to an acceptable level.**

The SWL Alternative scored highest based on the value planning criteria. It was able to accept 97 percent of the forecasted volumes for 2040 P.M. peak but provides deficient local operations. It improves crash potential but does require access management at the 42nd Street west frontage road. The summary of value planning scores is shown in Table 7-22.

Table 7-22: Summary of 32nd Avenue/US 81B Interchange Alternatives Under Existing Interstate Access Scenario

Alternative	Local Operations	Mainline Operations	Environmental Impacts	Safety	Cost	Technical Total	Technical Rank
WO	0	0	8	9	10	27	2
CER	5	4	6	0	0	15	4
NWL	0	0	6	4	2	12	5
SWL	5	7	6	10	5	33	1
DDI	0	0	6	9	6	21	3

47TH AVENUE INTERCHANGE SCENARIO

The 47th Avenue interchange would likely have significant impacts on 32nd Avenue/US 81B, expected to reduce traffic on 32nd Avenue/US 81B by more than 40 percent. The Spot Improvement Alternative was analyzed specifically for the 47th Avenue Interchange Scenario. This alternative includes

- At 38th Street, extend the eastbound right-turn lane (435 feet, full width) and install double left-turn lanes on the eastbound, westbound and southbound approaches.
- At the East Ramp, a double right-turn lane on the northbound off-ramp.
- Traffic control signal and access modification at the 42nd Street west frontage road intersection.
- Queue flushing on the off-ramps
- Pedestrian crossing enhancements at the ramp intersections that includes pedestrian actuation and prohibits right-turns.
- Reconstruct or major rehabilitation of pavement from the East Ramp to Columbia Road.

Under this alternative, all study intersection are LOS "D" or better; the ramp intersections operate at LOS "C" or better during both peak hours through 2040. This alternative would minimize queueing onto the interstate and improve traffic flow, which should mitigate some of the most prevalent crash trends. The signal at the 42nd Street west frontage road and improvements to the existing signal timing should improve pedestrian crossing safety. This analysis suggests constructing a 47th Avenue interchange would mitigate almost all improvements necessary on 32nd Avenue/US 81B.

Value planning scores for this alternative can be seen in Table 7-23 with planning level design layout in Figure 7-30.

Table 7-23: 32nd Avenue/US 81B Spot Improvement Interchange Alternative Under 47th Avenue Interchange Scenario

	Results (2040 Conditions)	Score
Local Operations	▪ A.M. Peak Average: 16.7, LOS "B" ▪ P.M. Peak Average: 31.9, LOS "C"	7
Mainline Operations	▪ Average A.M. Peak: 9.6, LOS "A" ▪ Average P.M. Peak: 18.6, LOS "C"	8
Environmental Impacts	▪ No additional environmental impacts expected.	8
Safety	▪ No change in crash potential expected. » 15.0% Crossing Crash Potential » 33.2% Rear End Crash Potential » 51.8% Sideswipe Crash Potential	6
Cost	▪ $700,000 plus the cost of interchange at 47th Avenue (discussed in next chapter)	10
Total		39

Other Alternatives

Other interchange alternatives were studied under the 47th Avenue Interchange Scenario, which reduces traffic on 32nd Avenue/US 81B by more than 40 percent. These alternatives do provide some benefits to local and mainline operations and safety. Brief descriptions are provided below with a summary table and layouts at the end of this chapter.

Consolidated East Ramp

The Consolidated East Ramp Alternative (CER) was identified in the 2040 LRTP but could not be cost constrained. It would realign 42nd Street east of I-29 with the East Ramp. This helps split southbound traffic at 38th Street, which is a major bottleneck along the corridor. A signal was included for 42nd Street west frontage road. During the 2040 P.M. peak the 38th Street intersection operates deficiently at LOS "E" with long queues on the minor approaches. No queueing or delay concerns during the 2040 A.M. peak.

This alternative comes at a cost of $15.7 million, plus the cost of the interchange at 47th Avenue, estimated between $23.2 and $28.5 million, discussed in the next section.

Value planning scores for this alternative can be seen in Table 7-24 with planning level design layout in Figure 7-31.

Northwest Loop Ramp

The Northwest Loop Ramp Alternative (NWL) adds a loop ramp for the westbound to southbound movements onto I-29 in the northwest quadrant. Due to the posted speeds and the ROW constraints, only a small radius could be constructed. This requires parallel merge lanes to ensure safe and efficient merging, which would likely be incompatible with a 47th Avenue interchange. The addition of the northwest loop helps eliminate crossing conflicts by converting a left-turn to a free right. The right-turn slip ramp on the southbound I-29 on-ramp requires access management at the 42nd Street west frontage road. A backage road was configured with a signal incorporated at 44th Street. During the 2040 P.M. peak all intersections operate efficiently, including 38th Street. However, there are long queues anticipated on the minor approaches at 38th Street. No queuing or delay concerns during the 2040 A.M. peak.

This alternative comes at a cost of $14.2 million, plus the cost of the interchange at 47th Avenue, estimated between $23.2 and $28.5 million, discussed in the next section.

Value planning scores for this alternative can be seen in Table 7-24 with planning level design layout in Figure 7-32.

Southwest Loop Ramp

The Southwest Loop Ramp Alternative (SWL) adds a loop ramp for the southbound to eastbound movements off of I-29 in the southwest quadrant. This configuration supports more than 400 vehicles during the 2040 P.M. peak hour, eliminating one signal phase and permitting right-turn-on-reds to improve through-put. No queueing is expected on the interstate ramps, but large queues build up at 38th Street and the 42nd Street west frontage road. A signal was included for 42nd Street west frontage road. There are some queueing concerns on the minor approaches at 38th Street. All other intersections operate effectively at LOS "D" or better. No queueing or delay concerns during the 2040 A.M. peak.

This alternative comes at a cost of $11.0 million, plus the cost of the interchange at 47th Avenue, estimated between $23.2 and $28.5 million, discussed in the next section.

Value planning scores for this alternative can be seen in Table 7-24 with planning level design layout in Figure 7-33.

Diverging Diamond Interchange

The Diverging Diamond Interchange Alternative (DDI) requires the two directions of traffic on 32nd Avenue/US 81B to cross to the opposite side of the road over I-29. This allows left-turning and right-turning traffic to perform a free flow movement onto the interstate on-ramp. The free-flowing movements reduce the signal phases to two at each intersection, significantly reducing delays. The right-turn slip ramp on the southbound I-29 on-ramp requires access management at the 42nd Street west frontage road. A backage road was configured with a signal incorporated at 44th Street. All intersections operate efficiently during the 2040 A.M. and P.M. peak. There are some queuing issues on the minor approaches at 38th Street during the 2040 P.M. peak.

This alternative comes at a cost of $8.5 million, plus the cost of the interchange at 47th Avenue, estimated between $23.2 and $28.5 million, discussed in the next section.

Value planning scores for this alternative can be seen in Table 7-24 with planning level design layout in Figure 7-34.

Table 7-24: 32nd Avenue/US 81B Alternatives Under 47th Avenue Interchange Scenario

	SI		CER		NWL		SWL		DDI	
	Results	Score	Results	Score	Results	Score	Results	Score	Results	Score
Local Operations	» A.M. Peak: 16.7, LOS "B" » P.M. Peak Average: 31.9, LOS "C"	7	» A.M. Peak: 18.2, LOS "B" » P.M. Peak Average: 37.0, LOS "D"	7	» A.M. Peak: 16.1, LOS "B" » P.M. Peak Average: 24.1, LOS "C"	7	» A.M. Peak: 16.1, LOS "B" » P.M. Peak Average: 33.4, LOS "C"	7	» A.M. Peak: 13.9, LOS "B" » P.M. Peak Average: 23.5, LOS "C"	8
Mainline Operations*	» A.M. Peak: 9.6, LOS "A" » P.M. Peak: 18.6, LOS "C"	8	» A.M. Peak: 14.5, LOS "B" » P.M. Peak: 19.2, LOS "C"	8	» A.M. Peak: 13.3, LOS "B" » P.M. Peak: 18.4, LOS "C"	8	» A.M. Peak: 13.5, LOS "B" » P.M. Peak: 18.0, LOS "C"	8	» A.M. Peak: 13.0, LOS "B" » P.M. Peak: 18.1, LOS "C"	8
Environmental Impacts	» No additional environmental impacts expected.	8	» 3.5 Acres of ROW required. No access changes.	6	» 2 Acres of ROW required. Access management at 42nd Street west frontage road.	6	» 2 Acres of ROW required. No access changes.	6	» 2 Acres of ROW required. Access management at 42nd Street west frontage road.	6
Safety	Baseline Crash Potential Distribution for Comparison » 15.0% Crossing » 33.2% Rear End » 51.8% Sideswipe	6	43.2% Increase in Crash Potential Compared to SI » 140.9% Increase in Crossing Crash Potential » 40.5% Decrease in Rear End Crash Potential » 82.2% Increase in Sideswipe Crash Potential	0	4.1% Decrease in Crash Potential Compared to SI » 0.9% Decrease in Crossing Crash Potential » 10.5% Decrease in Rear End Crash Potential » 0.3% Decrease in Sideswipe Crash Potential	9	5.0% Decrease in Crash Potential Compared to SI » 42.2% Increase in Crossing Crash Potential » 32.0% Decrease in Rear End Crash Potential » 4.9% Increase in Sideswipe Crash Potential	10	20.0% Increase in Crash Potential Compared to SI » 130.9% Increase in Crossing Crash Potential » 7.6% Increase in Rear End Crash Potential » 9.5% Increase in Sideswipe Crash Potential	5
Cost	» $700,000	10	» $15.7 Million	0	» $14.2 Million	1	» $11.0 Million	3	» $8.5 Million	5
Total	39		21		31		34		32	
Rank	1		5		4		2		3	

*Mainline operations does not incorporate friction between 32nd Avenue and 47th Avenue. This is discussed in greater detail in the next section.

47TH AVENUE

During the Macro Level Analysis completed for this study, the 47th Avenue interchange was studied to address future long-term development in southern Grand Forks. This analysis found an interchange at this location would reduce vehicle hours traveled by 4.4 million hours from 2025 to 2040 and vehicle miles traveled by 53.3 million miles from 2025 to 2040. This interchange is also estimated to reduce traffic on 32nd Avenue/US 81B by 40.3 percent, which is likely significant enough to prevent widening on 32nd Avenue/US 81B. However, the analysis also estimated a 21 percent increase in traffic on I-29. This increase in traffic on mainline I-29 may present merging, weaving and diverging challenges. Unlike analysis completed for other interchanges in this report, impacts between 32nd Avenue/US 81B and the 47th Avenue interchange alternatives were analyzed using the existing 32nd Avenue/US 81B on- and off-ramp configurations. Four alternatives were feasible based on the criteria established in this report.

- Traditional Diamond Interchange: A standard diamond interchange on the 47th Avenue alignment was considered the base alternative.
- Diamond with South Loops Interchange: A standard diamond interchange with a southeast loop ramp and southwest loop ramp on the 47th Avenue alignment. This alternative split the diverging movements to minimize the congestion between the 32nd Avenue/US 81B on-ramp and the 47th Avenue off-ramp. This provided improved operations at the ramp intersections by reducing the number of signal phases.
- Shifted Diamond with South Loops Interchange: A standard diamond interchange with a southeast loop on-ramp and southwest loop off-ramp shifted 0.25 miles south. This alternative also splits the diverging movements to minimize congestion but increases the spacing to allow more time for drivers to make the lane changes necessary.
- Shifted Diamond with No Business Impacts Interchange: This alternative is shifted 0.25 miles south and includes a southwest loop ramp for the on- and off-ramps and southeast loop on-ramp. This alternative avoids impacting the campground south of 47th Avenue and increases spacing between the 32nd Avenue/US 81B on-ramp and the 47th Avenue off-ramp.

ANALYSIS METHODOLOGY

These four alternatives were analyzed and presented below using the Value Planning approach detailed at the beginning of this report. The 47th Avenue interchange analysis is slightly different than the baseline methodology because it is a new interchange, with no existing conditions to compare.

MAINLINE OPERATIONS

Because of concerns regarding the I-29 mainline due to spacing and higher volumes, an alternative mainline analysis approach was used. Mainline operations for the 47th Avenue interchange analysis refers to the operations of I-29 between the merge and diverge points of 32nd Avenue/US 81B and 47th Avenue, including the 500-foot sections upstream and downstream of the 32nd Avenue/US 81B and 47th Avenue intersections. This change was made for two reasons: first, none of the alternatives analyzed on 47th Avenue found unique or deficient lane densities on the 500-foot section upstream of off-ramp and downstream of on-ramps; second, the nearly 14,000 ADT increase on I-29 associated with the 47th Avenue interchange could have capacity impacts outside of the interchange influence areas. Similar to the baseline methodology for mainline operations, the northbound and southbound densities were averaged to provide one score.

COST

Typically, the interchange alternatives would be scored using a distribution between highest cost alternative and lowest cost alternative. The Southwest Loop Alternative (SWL) for the 32nd Avenue/US 81B alternative under the Existing Interstate Access Scenario was the prioritized alternative based on technical criteria. The SWL was included in the range of costs to provide valuable context related to the true impacts of a 47th Avenue interchange; it has a cost of $23.5 million. The range of costs was scored using the Cost scoring criteria table established in the methodology section above.

INTERCHANGE ALTERNATIVES

Analysis presented below was completed using ADT forecasts from the 47th Avenue Interchange Scenario.

TRADITIONAL DIAMOND ALTERNATIVE

The Traditional Diamond Alternative (TD) is a standard diamond interchange with signals at the East Ramp, West Ramp and 38th Street intersections. It operates at LOS "D" or better for both 2040 A.M. and P.M. peak hours. There are no queueing concerns that would impact I-29. This alternative provides spacing challenges between the 32nd Avenue/US 81B southbound on-ramp and the 47th Avenue off-ramp, which results in some lane densities that fall to LOS "D" during the 2040 P.M. peak. This alternative will require relocation to the campground in the southwest quadrant but the least amount of right-of-way at 61 acres. Value planning scores for this alternative can be seen in Table 7-25 with planning level design layout in Figure 7-36.

Table 7-25: 47th Avenue Traditional Diamond Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 14.9, LOS "B" ▪ P.M. Peak Average: 32.6, LOS "C"	7
Mainline Operations	▪ A.M. Peak Average: 14.4, LOS "B" ▪ P.M. Peak Average: 29.3, LOS "D"	7
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. Business impacts and relocation necessary. 63 acres of ROW needed.	6
Safety	▪ Baseline crash potential distribution for alternative comparison: » Crossing: 9.4% of total estimated crash potential » Rear End: 81.2% of total estimated crash potential » Lane Change: 9.4% of total estimated crash potential	0
Cost	▪ $24.6 Million	5
Total		25

DIAMOND WITH SOUTH LOOPS ALTERNATIVE

The Diamond with South Loops Alternative (DL) is a diamond interchange with a southeast loop ramp for eastbound to northbound on-ramp movements and a southwest loop ramp for southbound to eastbound off-ramp movements. By removing left-turns, some crossing conflicts are eliminated, as well as enabling the traffic control signal to operate with reduced phases, improving efficiency. This alternative operates effectively during both 2040 A.M. and P.M. peak hours and does not have queueing concerns. This alternative has the lowest estimated crash potential, as well as providing acceptable levels of service for local operations, but does require business impacts and 87 acres of ROW needed, the most of all four build alternatives. As for mainline operations, this alternative does result in some lane densities between 32nd Avenue/US 81B and 47th Avenue falling to LOS "D" during the 2040 P.M. peak. Value planning scores for this alternative can be seen in Table 7-26 with planning level design layout in Figure 7-37.

Table 7-26: 47th Avenue Diamond with South Loops Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 12.0, LOS "B" ▪ P.M. Peak Average: 15.3, LOS "B"	9
Mainline Operations	▪ A.M. Peak Average: 14.8, LOS "B" ▪ P.M. Peak Average: 29.3, LOS "D"	6
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. Business impacts and relocation necessary. 63 acres of ROW needed.	6
Safety	▪ 59.4% Reduction in Crash Potential when Compared Against Diamond » 29.1% reduction in crossing crash potential » 68.1% reduction in rear end crash potential » 15.0% reduction in sideswipe crash potential	10
Cost	▪ $27.2 Million	1
Total		32

DIAMOND WITH SOUTH LOOPS AND MIXING LANES ALTERNATIVE

The Diamond with South Loops and Mixing Lanes Alternative (DLM) is the same interchange configuration as above but includes mixing lanes (also referred to as auxiliary lanes, speed-change lane or acceleration lane) between 32nd Avenue/US 81B and 47th Avenue to improve lane density during the peak hours. This requires about 1,000 feet of extra lane length for each direction of traffic on I-29. These mixing lanes would keep lane densities at LOS "A" during the 2040 A.M. peak and LOS "C" during the 2040 P.M. peak. Local operations, environmental impacts and safety remain unchanged. Value planning scores for this alternative can be seen in Table 7-27. Planning level designs at the interchange are similar to Figure 7-37.

Table 7-27: 47th Avenue Diamond with South Loops and Mixing Lanes Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 12.0, LOS "B" ▪ P.M. Peak Average: 15.3, LOS "B"	9
Mainline Operations	▪ A.M. Peak Average: 10.9, LOS "A" ▪ P.M. Peak Average: 18.8, LOS "C"	8
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. Business impacts and relocation necessary. 63 acres of ROW needed.	6
Safety	▪ 59.4% Reduction in Crash Potential when Compared Against Diamond » 29.1% reduction in crossing crash potential » 68.1% reduction in rear end crash potential » 15.0% reduction in sideswipe crash potential	10
Cost	▪ $28.5 Million	0
Total		33

SHIFTED DIAMOND WITH SOUTH LOOPS ALTERNATIVE

The Shifted Diamond with South Loops Alternative (SDL) is the same geometric design as the South Loops Interchange Alternative, just shifted 0.25 miles south. This improves spacing between the 32nd Avenue/US 81B interchange. This alternative operates effectively both on local and mainline operations. However, during the 2040 P.M. peak, some lane densities fall to LOS "D". This alternative improves estimated crash potential, when compared against the Diamond Interchange. It also impacts the campground and will require a buyout and 78 acres of ROW needed. Value planning scores for this alternative can be seen in Table 7-28 with planning level design layout in Figure 7-38.

Table 7-28: 47th Avenue Shifted Diamond with South Loops Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 11.7, LOS "B" ▪ P.M. Peak Average: 14.5, LOS "B"	9
Mainline Operations	▪ A.M. Peak Average: 14.2, LOS "B" ▪ P.M. Peak Average: 26.8, LOS "D"	7
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. Business impacts and relocation necessary. 78 acres of ROW needed.	5
Safety	▪ 57.5% Reduction in Crash Potential when Compared Against Diamond » 34.8% reduction in crossing crash potential » 66.7% reduction in rear end crash potential » 1.4% reduction in sideswipe crash potential	» 9
Cost	▪ $27.6 Million	1
Total		31

SHIFTED DIAMOND WITH NO BUSINESS IMPACTS

The Shifted Diamond with No Business Impacts Alternative (SNI) shifts the interchange alignment 0.25 miles south and folds the southbound off-ramp to eliminate the business impacts. This alternative operates effectively during both 2040

A.M. and P.M. peak hours with no queueing concerns that would impact I-29. It improves crash potential when compared against the Diamond Interchange alternative with effective local and mainline operations. Eliminating the business impacts and low ROW needed helps this alternative score high in the Environmental Impacts category and Cost. Value planning scores for this alternative can be seen in Table 7-29 with planning level design layout in Figure 7-39.

Table 7-29: 47th Avenue Shifted Diamond with No Business Impacts Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 11.4, LOS "B" ▪ P.M. Peak Average: 16.9, LOS "B"	9
Mainline Operations	▪ A.M. Peak Average: 14.3, LOS "B" ▪ P.M. Peak Average: 26.7, LOS "D"	7
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. No business impacts. 59 acres of ROW needed.	6
Safety	▪ 56.9% Reduction in Crash Potential when Compared Against Diamond » 12.7% increase in crossing crash potential » 70.2% reduction in rear end crash potential » 11.4% reduction in sideswipe crash potential	9
Cost	▪ $23.2 Million	10
Total		41

SUMMARY OF ALTERNATIVES

The Shifted Folded Southbound Off-Ramp Interchange Alternative scored highest on the Value Planning analysis with strong scores in local and mainline operations, safety and low cost. It does not require impacts which improves its environmental impact score relative to other alternatives for 47th Avenue.

The value planning scores summary for 47th Avenue interchange alternatives is shown in Table 7-30.

Table 7-30: Summary of 47th Avenue Interchange Alternatives

Alternative	Local Operations	Mainline Operations	Environmental Impacts	Safety	Cost	Technical Total	Technical Rank
TD	7	7	6	0	5	25	5
DL	9	6	6	10	1	32	3
DLM	9	8	6	10	0	33	2
SDL	9	7	5	9	1	31	4
SNI	9	7	6	9	10	41	1

STEERING COMMITTEE RANKING

As part of the Value Planning workshop, the Steering Committee was asked to rank the alternatives; the Diamond with South Loops and Mixing Lanes and the Shifted Diamond with No Business Impacts were tied with 33.3 percent of the Steering Committee ranking each as their first choice.

those improvements included in the I-29 Corridor Study, none are currently cost constrained in the GF-EGF MPO Long Range Transportation Plan (LRTP).

Needs Comparison

Comparing needs for different improvements can be a very complicated process. For example, how do you compare a railroad grade separation improvement to a new interchange to a new loop? A railroad grade separation generates major delays but only occurs a few times per day, mostly during off-peak periods. A new interchange may provide massive relief for several hours of the day but may not be needed for several years.

The current Transportation Improvement Program (TIP) process utilizes a project scoring and ranking process. A more technically based project specific evaluation process was needed to support the I-29 Corridor Study Implementation Plan. To assess needs, a five point needs index was developed to show relative need. This starts with the technical information compiled in this study and other studies as necessary to compare quantified benefits. Quantified benefits incorporate vehicle hours of delay, vehicle miles travelled and crash reduction factors. For example, the 2040 yearly quantified benefits for an interchange at 47th Avenue is $3.2 million and for a railroad grade separation at 42nd Street and DeMers Avenue is $0.6 million. Where quantified benefits were not readily available, level of service and railroad crossing exposure were compared.

This information was used to provide an educated estimate of need for every improvement over $1 million for existing, 2025 and 2040 time periods. This information will be refined by the Steering Committee. The results are illustrated in Table 8-2.

Table 8-2: Needs by Year

Location	Improvement	Need			
		Existing	2025	2040	Notes
North Washington Street/CR 11/US 81	Interchange and Access Improvements	0	0.5	1	The Washington Street improvements are preventive in nature and not based on quantified deficiencies.
Gateway Drive/US 2	Interchange Improvements	1	2	5	The Gateway Drive interchange operates at LOS "F" by 2040.
	Railroad Grade Separation	2	2.5	3	Queuing onto the interstate when train events and peak hours coincide. The railroad grade separation has a crossing exposure of 245,000 by 2040.*
DeMers Avenue/ND 297	Interchange Improvements	2	4	5	The DeMers Avenue interchange operates at LOS "E" by 2025 and LOS "F" by 2040.
	42nd Street Railroad Grade Separation	3	3.5	4	The grade separation has a yearly quantified benefit of $0.6 million dollars by 2040 and crossing exposure of 749,700 by 2040.*
32nd Avenue/US 81B	New Interchange at 47th Avenue	2	5	5	32nd Avenue Operates at LOS "F" by 2025, has a yearly quantified benefit of $3.2 M by 2040.
Merrifield Road/CR 6	New Interchange	2.5	3	3.5	The Merrifield Interchange has a yearly quantified benefit of 2.4 million dollars by 2040.

0 = No need, 5 = Greatest Need

* Based on previous study, may require updating

LONG RANGE: 2031-2040+

This stage represents year 11 and beyond the current TIP and extends to the life of the current 2040 Long Range Transportation Plan (LRTP). Figure 8-6 demonstrates the long-range phase of project development efforts required to implement the I-29 Corridor Study.

Costs shown demonstrate a year of expenditure estimate to the mid-range of the phase for which construction is anticipated per the I-29 Corridor Study. Projects in the mid-range are adjusted to YOE of 2036. Table 8-3 demonstrates a more descriptive dialogue of the implementation efforts needed at each phase of implementation for the most significant projects. Table 8-3 should be treated as a tentative set of actions needed to address needs identified by the I-29 Corridor Study. As additional planning and programming efforts unfold beyond the completion of the I-29 Corridor Study, these assumptions may change.

Stages of Project Development & Delivery

The I-29 Implementation Plan assists with stratifying the stage of planning and project development required to deliver each of the above mentioned projects. This is specifically important for more of the complex projects and for those projects which will require additional scoping to move out of the planning phase and deeper into advanced project development. The Implementation Plan has been developed around the following generalized Stages of Project Delivery:

- **Planning & Environmental (Preliminary Engineering/Scoping)**: Reflects additional planning or project level scoping to continue to define and delineate alternatives and project feasibility. This phase also includes the transition into the development of relevant environmental documentation. In many cases, the alternatives developed as part of the I-29 Corridor Study are assumed to be ready to move further into project development (i.e. environmental/NEPA). In the case of interchanges at 47th Avenue and Merrifield Road/CR 6, this phase includes completion of an IJR. However, some of these actions may not result in a signed environmental document until such time as Federal funds are programmed, or FHWA fiscal constraint requirements can be met.
- **Right-of-Way, Design and Construction (Advanced Project Development):** Reflects efforts following completion of a signed environmental document. These are stages of advanced project development involving actual final design and right of way. Included in this phase would also be efforts to secure final programming (or project selection). Advanced project development includes the construction phase.

The implementation plan will assign one of these two general categories to identified improvements listed in the I- 29 Corridor Study. Smaller less significant projects which will likely fit more easily into the GF-EGF TIP or move quickly in the first phase or two are not noted. For more complex projects, the transition through these stages is more gradual, and more thoughtfulness is needed on how these projects continue to transition out of planning and further into project development.

32ND AVENUE/US 81B NEEDS

Due to the major investment needed at 32nd Avenue/US 81B, and the coordinated needs between 32nd Avenue/US 81B and 47th Avenue, additional analysis was completed to determine the approximate thresholds where 32nd Avenue/US 81B begins to breakdown. This analysis increased the modeled traffic volumes based on linear growth between the existing and approved 2025 ADT projections and then between the approved 2025 ADT and 2040 ADT projections.

- According to the 2025 P.M. peak hour analysis, deficiencies along the corridor emerged. However, there are key issues that emerge before 2025.
  - » At around 40 percent (2019) of the growth between 2015 and 2025, deficient operations are expected at 38th Street.
  - » By 70 percent (2022) of the growth between 2015 and 2025, the northbound off-ramp begins to queue onto the interstate.
  - » By 2025, deficient operations are expected at the West Ramp, East Ramp and 38th Street intersections during the P.M. peak hour.

- With the Spot Improvements on 32nd Avenue/US 81B, 2025 operations are improved to LOS "D" across the corridor. However, as growth continues capacity constraints on the overpass bridge begin to emerge around 2030, or 30 percent of growth expected between 2025 and 2040. The capacity constraints result in deficient operations at the West Ramp intersection and queues onto the interstate.

Figure 8-2: 2015 to 2025 Growth Thresholds with Existing Configuration on 32nd Avenue/US 81B

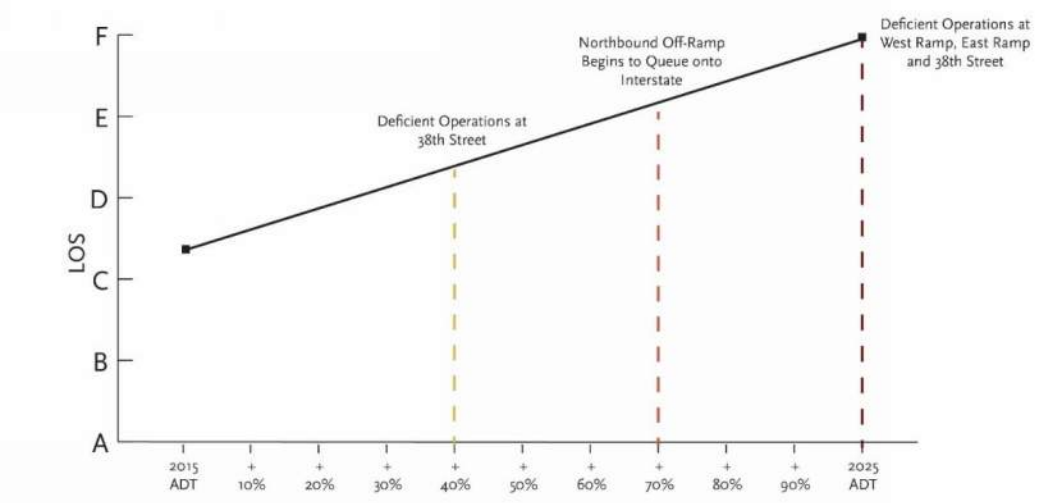
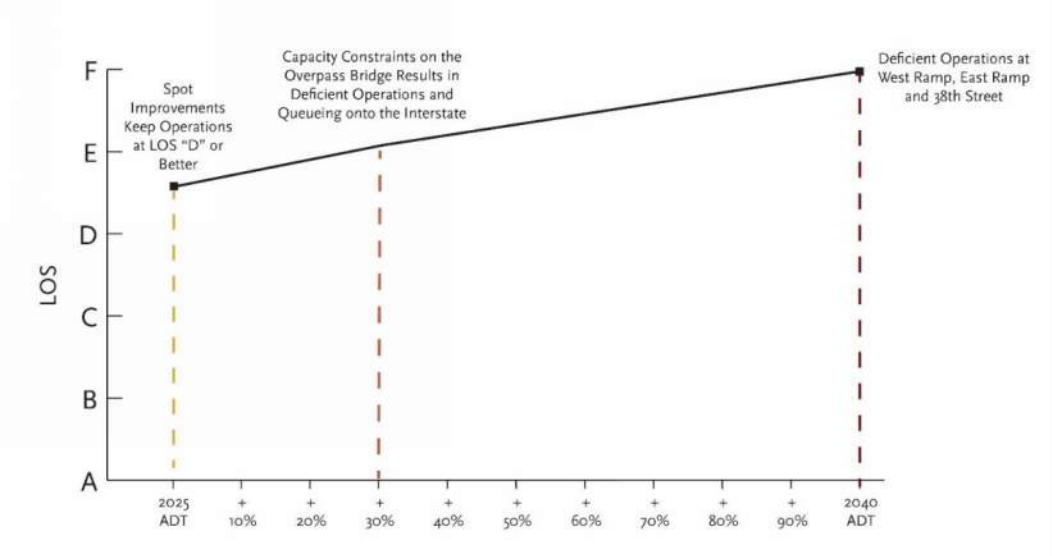


Figure 8-3: 2025 to 2040 Growth Thresholds with Spot Improvements on 32nd Avenue/US 81B



ANCILLARY INVESTMENTS TO SUPPORT 47TH AVENUE INTERCHANGE

As noted, the Implementation Plan for the I-29 Corridor Study is not cost constrained. Further, it is a demonstration of needed improvements more narrowly focused on the I-29 Corridor and adjacent systems. To that end, development of a future interchange at 47th Avenue will require substantial additional investment in local roadways. In current year dollars, total needs to provide local roadway system to support 47th Avenue is estimated at nearly $17.0 million. This system of roadways is shown as part of Figure 8-1 and Figure 8-4, and includes extension and/or completion of 34th Street, 38th Street,

Grade Separation) are shown with a potential for Regional funding. Urban funds are shown on both Regional and or Interstate projects. This is done to indicate that broad partnerships may be needed to fully program these investments on a more accelerated time frame.

Programming Splits

Table 8-5 demonstrates a tentative set of programming and cost splits for the most significant project improvements identified through the I-29 Corridor Study. These cost splits are based upon current local, state and federal funding guidance. More specific guidance regarding local, state and federal funding splits is available in the *NDDOT Local Government Manual*. These splits generally follow that guidance, however Table 8-5 represents a best-case scenario. It is likely many of these improvements will require more local resources to construct improvements in the phases identified by the I-29 Corridor Study.

Table 8-5: Funding Matrix

Project	Total Cost (2017 $)	Total Cost (YOE $)	Funding Split (YOE $)			
			Federal	State	City	County
North Washington/CR 11/US 81						
Access Modification + Ramp Modification	**$5.700**	**$12.489**	$9.99	$1.25	$0.000	$1.25
Gateway Drive/US 2						
Northeast Loop Modification	**$6.600**	**$14.461**	$11.57	$1.45	$1.45	$0.000
Gateway Drive Grade Separation	**$28.300**	**$62.009**	$49.61	$6.20	$6.20	$0.000
DeMers Avenue/ND 297						
42nd Street Grade Separation*	**$40.000**	**$61.578**	$21.55	$0.000	$40.026	$0.000
Capacity Enhancements (No Bridge Widening)	**$7.400**	**$9.003**	$7.20	$0.90	$0.90	$0.000
32nd Avenue/US 81B						
Reconstruct 38th Street to Columbia Road	**$12.000**	**$18.473**	$14.78	$1.85	$1.85	$0.000
47th Avenue						
Construct New Interchange	**$28.500**	**$43.874**	$39.49	$4.39	$0.000	$0.000
Merrifield Road/CR 6						
Modify Overpass to Full Interchange	**$16.480**	**$36.110**	$32.50	$3.61	$0.000	$0.000

** 25% Urban Roads + 10% Regional; Balance of cost Local*
***YOE costs were estimated using the midpoint of the implementation phase for which they are anticipated to be constructed.*

Setup Scoring Categories & Factors

Score System: Regional Urban Roads - ND Max. Score: 100

Go Back

Adjust Scoring Categories

(Use TAB key to navigate.)

	Category	Description	Weights		Points		
1	Economic Vitality	Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.	10	%	10	pts	Delete
2	Security	Increase security of the transportation system for motorized and nonmotorized uses.	5	%	5	pts	Delete
3	Accessibility and Mobility	Increase the accessibility and mobility options to people and freight.	15	%	15	pts	Delete
4	Environmental/Energy/QOL	Protect and enhance the environment, promote energy conservation,and improve quality of life.	10	%	10	pts	Delete
5	Integration and Connectivity	Enhance the integration and connectivity of the transportation system across and between modes for people and freight.	10	%	10	pts	Delete
6	Efficient System Management	Promote efficient system management and operation.	5	%	5	pts	Delete
7	System Preservation	Emphasize the preservation of the existing transportation system.	20	%	20	pts	Delete
8	Safety	Increase safety of the transportation system for motorized and nonmotorized uses.	15	%	15	pts	Delete
9	Local/Regional Factors	Factors of local or regional importance	10	%	10	pts	Delete
		TOTAL	100	**%**	100	**pts**	

Add New Category

			Add

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	I-29 and 47th Ave Interchange NEPA Documentation - 2020

Category 1 Economic Vitality		
Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.		Assign score 0 or 1
A	Consistent with local, regional or state econimic development plans	0
B	Work located on identified truck route or identified in Freight Study	1
C	Provides new access to jobs and opportunities	0
D	Improves connection to terminal (sea, air, multimodal) on the last mile or two ac	0

Category 2 Security		
Increase security of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Install equipment that monitors the security of the transportation infrastructure	0
B	Consistent with regional emergency/security/hazardous materials movement.	0
C	Coordinates/improves Bridge Closure Management Plan	0
D	Coordinates/improves Special Events Management Plans	0

Category 3 Accessibility and Mobility		
Increase the accessibility and mobility options to people and freight.		Assign score 0 or 1
A	Provides accepatble LOS for facility as recommended in LRTP	0
B	Consistent with access control regulations	0
C	Enhances accessibility and mobility for all modes	0
D	Address LOS deficiency not resolved by another planned project	0
E	Enhances the range of freight service options available to area businesses	0

Category 4 Environmental/Energy/QOL		
Protect and enhance the environment, promote energy conservation,and improve quality of life.		Assign score 0 or 1
A	Demonstrates core context sensitive solutions principles	0
B	Addresses EJ analysis process	0
C	Decreases fuel consumption which reduces greenhouse gas	0
D	Avoids or minimize impacts to wetlands or other natural habitats	1
E	Incoporates innovative stormwater management techniques	0
F	Promotes nonmotorized travel	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number | **Project Name**: I-29 and 47th Ave Interchange NEPA Documentation - 2020

Category 5 Integration and Connectivity		
Enhance the integration and connectivity of the transportation system across and between modes for people and freight.		**Assign score 0 or 1**
A	Reduces excessive travel delays	0
B	Improves direct travel trips between states	0
C	Address last segment/link of corridor	0
D	Improves the integration/connectivity of whole transportation system	0
E	On Regional Primary Road	0

Category 6 Efficient System Management		
Promote efficient system management and operation.		**Assign score 0 or 1**
A	Incorporates elements from ITS Strategic Plan	0
B	Improving operations without adding through capacity	0
C	Enhances interoperability amoung modal equipment/technologies	0
D	Contributes to better collecting traffic data	0

Category 7 System Preservation		
Emphasize the preservation of the existing transportation system.		**Assign score 0 or 1**
A	Utilize pavement management system results	0
B	Emphasizes system rehabilitation rather than expansion	0
C	Incorporates technologies new to the MPO area	0
D	Maximizes existing capacity	0
e	Contributes to better system maintenance	0

Category 8 Safety		
Increase safety of the transportation system for motorized and nonmotorized uses.		**Assign score 0 or 1**
A	Address locations identified as high crash locations in LRTP, coridor studies, hi	0
B	Enhances safe route to school route	0
C	Consistent with Strategic Highway Safety Plan	0
D	Improves points of conflict	0
E	Enhances the public safety of nonmotorized users	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	I-29 and 47th Ave Interchange NEPA Documentation - 2020

Category 9 Local/Regional Factors		
Factors of local or regional importance		**Assign score 0 or 1**
A	Conformance with regional or state plan	0
B	Demonstrates analysis of project risk in implementation	1
C	Provides benefit for multiple transportation agencies	1
D	Advances smart growth objectives	0

PROJECT SCOPING WORKSHEET

DATE: 1/17/2017

PRIORITY: Secondary Regional request for a mill and overlay project in 2020

City: Grand Forks

Street: Bus US 81 (Hammerling Ave to Demers Ave and 1st Ave N to 8th Ave N)

County: Grand Forks

Length: ~5,700 ft

Proposed Improvement: Bus US 81/Washington St (Hammering Ave to Demers Ave and 1st Ave N to 8th Ave N) mill & overlay, ADA curb ramps, catch basin and curb and gutter repairs as needed.

Cost Estimates Breakdown (in $1,000)							
Alternate	PE	R/W	Utility	Constr.	Bridges	Misc.	Total
				1,310			1,310

Present Road: Surface Width?
60' Back of Curb to Back of Curb
Surface Type? 9" Concrete with 2" Asphalt Overlay
On Street Parking Allowed? Present: No Proposed: No

Proposed Improvements

ADT Present: 8,805-14,950 Yr: 2015 Travel Way Width : 60'
ADT Design: 11,260-32,870 Design year: 2040 No. of Lanes: 5
Design Speed: 35 MPH Roadway Width: 60'
Maximum Curve: Min. R/W Width:
Maximum Grade:

Right of Way

Will Additional ROW or easement be acquired? Construction easements for curb ramps
ROW acquisition by: NDDOT
Has any ROW easements been acquired since 7-1-72: Unknown ROW Condemnation by:
Est. No. of occupied family dwelling to be displaced? 0
Est. No. business to be displaced?0

Impacts

Will there be any additional Impacts (Cultural and Environmental Resources): No
Will there be any taking of any right-of-way from any public parkland (4F) or schools (6F): No
Airports: No Public Hearings:
Environmental Classification (Cat-Ex, EA, EIS): Cat-Ex
Transportation Enhancements: Temporary lane closures likely during milling and paving
Intermodal: Temporary closures and rerouting likely for updating curb ramps

Railroads Crossings						
RR Name	No. Xings	No. Tracks and Type of Crossing	Daily Train Movements	Train Speed	Present Protection	Proposed Protection
None						

Purpose and Need Statement For Regional Projects

1. According to the 2012 Washington St Corridor Study, the pavement on Bus US 81/ Washington St was constructed and rehabilitated at different times. Bus US 81/Washington St from 1st Ave N to 8th Ave N was originally constructed in 1952 with structural overlays in 1970, 1985 and 2002. Bus US 81/Washington St from Demers Ave to Hammerling Ave was originally constructed in 1952 with structural overlays in 1974, and mill and overlays in 1985 and 2002. By the time this project is proposed to occur the surface asphalt pavement will be 18 years old.

Remarks:

City Engineer: _____ Date: 1/17/18

District Engineer: _____ Date: 1/18/18

Project: Bus US 81/Washington St Mill & Overlay (8th Ave N to 1st Ave N, Demers Ave to Hammerling Ave)
2" Thick Mill & Overlay
10/6/2017

SPEC NO.	CODE NO.	ITEM DESCRIPTION	UNIT	Total Quantity	UNIT PRICE	ITEM TOTAL
103	0100	CONTRACT BOND	L SUM	1	$ 8,000.00	$ 8,000.00
202	0130	REMOVAL OF CURB AND GUTTER	LF	1220	$ 10.00	$ 12,200.00
251	0300	SEEDING CLASS III	ACRE	0.02	$ 50,000.00	$ 1,000.00
253	0201	HYDRAULIC MULCH	ACRE	0.02	$ 50,000.00	$ 1,000.00
401	0050	TACK COAT	GAL	2790	$ 3.24	$ 9,052.99
411	0105	MILLING PAVEMENT SURFACE	SY	37100	$ 1.08	$ 40,127.36
430	0045	SUPERPAVE FAA 45	TON	4200	$ 60.00	$ 252,000.00
430	1000	CORED SAMPLE	EA	30	$ 48.67	$ 1,460.16
430	5828	PG 58-28 ASPHALT CEMENT	TON	210	$ 638.14	$ 134,010.24
702	0100	MOBILIZATION	L SUM	1	$ 79,000.00	$ 79,000.00
704	0100	FLAGGING	MHR	1840	$ 45.43	$ 83,586.05
704	1000	TRAFFIC CONTROL SIGNS	UNIT	2207	$ 2.25	$ 4,965.75
704	1052	TYPE III BARRICADE	EA	81	$ 85.00	$ 6,885.00
704	1054	SIDEWALK BARRICADE	EA	20	$ 75.00	$ 1,500.00
704	1055	PEDESTRIAN LONGITUDINAL BARRICADE	LF	900	$ 17.00	$ 15,300.00
704	1060	DELINEATOR DRUMS	EA	194	$ 28.00	$ 5,432.00
704	1067	TUBULAR MARKERS	EA	161	$ 9.00	$ 1,449.00
704	1087	SEQUENCING ARROW PANEL - TYPE C	EA	2	$ 1,100.00	$ 2,200.00
706	0550	BITUMINOUS LABORATORY	EA	1	$ 4,000.00	$ 4,000.00
706	0600	CONTRACTOR'S LABORATORY	EA	1	$ 4,000.00	$ 4,000.00
708	1540	INLET PROTECTION-SPECIAL	EA	84	$ 170.00	$ 14,280.00
708	1541	REMOVE INLET PROTECTION-SPECIAL	EA	84	$ 100.00	$ 8,400.00
722	0315	MANHOLE CASTING	EA	9	$ 825.00	$ 7,425.00
722	3445	CASTING INLET-TYPE 1	EA	9	$ 815.00	$ 7,335.00
722	6160	ADJUST INLET	EA	21	$ 300.00	$ 6,300.00
722	6200	ADJUST MANHOLE	EA	21	$ 250.00	$ 5,250.00
748	0140	CURB & GUTTER TYPE I	LF	1220	$ 40.00	$ 48,800.00
750	0125	SIDEWALK CONCRETE -5IN	SY	440	$ 85.00	$ 37,400.00
750	2115	DETECTABLE WARNING PANELS	SF	780	$ 45.00	$ 35,100.00
762	0112	EPOXY PVMT MK MESSAGE	SF	608	$ 9.00	$ 5,472.00
762	0113	EPOXY PVMT MK 4IN LINE	LF	22800	$ 0.50	$ 11,400.00
762	0114	EPOXY PVMT MK 6IN LINE	LF	5700	$ 2.25	$ 12,825.00
762	0117	EPOXY PVMT MK 24IN LINE	LF	768	$ 8.00	$ 6,144.00

Subtotal	$ 873,299.55
~20% Contingencies	$ 174,700.45
Subtotal	$ 1,048,000.00
Construction Engineering 10%	$ 105,000.00
ROW / Ease 1%	$ 11,000.00
2017 Project Total	**$ 1,164,000.00**

2017 Subtotal Inflated to 2020 @ 4%	$ 982,343.23
~20% Contingencies	$ 197,656.77
Subtotal	$ 1,180,000.00
Construction Engineering ~10%	$ 118,000.00
ROW / Ease ~1%	$ 12,000.00
2020 Project Total	**$ 1,310,000.00**

Setup Scoring Categories & Factors

Score System: Regional Urban Roads - ND Max. Score: 100

Go Back

Adjust Scoring Categories

(Use TAB key to navigate.)

	Category	Description	Weights		Points		
1	Economic Vitality	Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.	10	%	10	pts	Delete
2	Security	Increase security of the transportation system for motorized and nonmotorized uses.	5	%	5	pts	Delete
3	Accessibility and Mobility	Increase the accessibility and mobility options to people and freight.	15	%	15	pts	Delete
4	Environmental/Energy/QOL	Protect and enhance the environment, promote energy conservation,and improve quality of life.	10	%	10	pts	Delete
5	Integration and Connectivity	Enhance the integration and connectivity of the transportation system across and between modes for people and freight.	10	%	10	pts	Delete
6	Efficient System Management	Promote efficient system management and operation.	5	%	5	pts	Delete
7	System Preservation	Emphasize the preservation of the existing transportation system.	20	%	20	pts	Delete
8	Safety	Increase safety of the transportation system for motorized and nonmotorized uses.	15	%	15	pts	Delete
9	Local/Regional Factors	Factors of local or regional importance	10	%	10	pts	Delete
		TOTAL	100	**%**	100	**pts**	

Add New Category

			Add

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	Bus US 81/Washington St Hammerling Ave to Demers Ave & 1st Ave N to 8th Ave N Mill & Overlay 2020

Category 1 Economic Vitality		
Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.		Assign score 0 or 1
A	Consistent with local, regional or state econimic development plans	0
B	Work located on identified truck route or identified in Freight Study	1
C	Provides new access to jobs and opportunities	0
D	Improves connection to terminal (sea, air, multimodal) on the last mile or two ac	0

Category 2 Security		
Increase security of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Install equipment that monitors the security of the transportation infrastructure	0
B	Consistent with regional emergency/security/hazardous materials movement.	0
C	Coordinates/improves Bridge Closure Management Plan	0
D	Coordinates/improves Special Events Management Plans	0

Category 3 Accessibility and Mobility		
Increase the accessibility and mobility options to people and freight.		Assign score 0 or 1
A	Provides accepatble LOS for facility as recommended in LRTP	0
B	Consistent with access control regulations	0
C	Enhances accessibility and mobility for all modes	0
D	Address LOS deficiency not resolved by another planned project	0
E	Enhances the range of freight service options available to area businesses	0

Category 4 Environmental/Energy/QOL		
Protect and enhance the environment, promote energy conservation,and improve quality of life.		Assign score 0 or 1
A	Demonstrates core context sensitive solutions principles	0
B	Addresses EJ analysis process	0
C	Decreases fuel consumption which reduces greenhouse gas	0
D	Avoids or minimize impacts to wetlands or other natural habitats	1
E	Incoporates innovative stormwater management techniques	0
F	Promotes nonmotorized travel	1

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	Bus US 81/Washington St Hammerling Ave to Demers Ave & 1st Ave N to 8th Ave N Mill & Overlay 2020

Category 5 Integration and Connectivity		
Enhance the integration and connectivity of the transportation system across and between modes for people and freight.		Assign score 0 or 1
A	Reduces excessive travel delays	0
B	Improves direct travel trips between states	0
C	Address last segment/link of corridor	0
D	Improves the integration/connectivity of whole transportation system	0
E	On Regional Primary Road	0

Category 6 Efficient System Management		
Promote efficient system management and operation.		Assign score 0 or 1
A	Incorporates elements from ITS Strategic Plan	0
B	Improving operations without adding through capacity	1
C	Enhances interoperability amoung modal equipment/technologies	0
D	Contributes to better collecting traffic data	0

Category 7 System Preservation		
Emphasize the preservation of the existing transportation system.		Assign score 0 or 1
A	Utilize pavement management system results	1
B	Emphasizes system rehabilitation rather than expansion	1
C	Incorporates technologies new to the MPO area	0
D	Maximizes existing capacity	1
e	Contributes to better system maintenance	1

Category 8 Safety		
Increase safety of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Address locations identified as high crash locations in LRTP, coridor studies, hi	0
B	Enhances safe route to school route	0
C	Consistent with Strategic Highway Safety Plan	0
D	Improves points of conflict	0
E	Enhances the public safety of nonmotorized users	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name Bus US 81/Washington St Hammerling Ave to Demers Ave & 1st Ave N to 8th Ave N Mill & Overlay 2020

Category 9 Local/Regional Factors		
Factors of local or regional importance		**Assign score 0 or 1**
A	Conformance with regional or state plan	1
B	Demonstrates analysis of project risk in implementation	1
C	Provides benefit for multiple transportation agencies	1
D	Advances smart growth objectives	0

PROJECT SCOPING WORKSHEET

DATE: 1/17/2018

PRIORITY: Secondary Regional system for construction in 2021

City: Grand Forks

Street: Bus US 81/Washington St
Segment #1: Mile 944.464 to 945.105 8th Ave N to Gateway Dr (0.641 miles).
Segment #2: Mile 945.105 to 945.504 4-lane section from Gateway Dr. north (0.399 miles)
Segment #3: Mile 947.334 to 947.634 Section built with English Coulee Diversion (0.300 miles)

County: Grand Forks

Length: Gross length = 3.170 miles
Net length = 1.340 miles

Proposed Improvement: Concrete pavement repair and grind segments #1 & #3, concrete pavement repair, dowel bar retrofit, and grind segment #2. If consistent with a preventative maintenance project, evaluate the need for a pedestrian crossing at Gateway and Washington.

Cost Estimates Breakdown (in $1,000)							
Alternate	PE	R/W	Utility	Constr.	Bridges	Misc.	Total
				1,480			1,480

Present Road: Surface Width? Segments #1 & #2, 4 lane divided Surface Type? Concrete
Segment #3 2-lane rural

On Street Parking Allowed? Present: No Proposed: No

Proposed Improvements

ADT Present: 15,640 (south end) Yr: 2015 Travel Way Width : 60'
ADT Design: 11,260-32,870 Design year: 2040 No. of Lanes: 4 & 2
Design Speed: 40 MPH (urban) & 65 mph (rural) Roadway Width: 12 foot lanes
Maximum Curve: Min. R/W Width:
Maximum Grade:

Right of Way

Will Additional ROW or easement be acquired? No ROW acquisition by:
Has any ROW easements been acquired since 7-1-72: ROW Condemnation by:
Est. No. of occupied family dwelling to be displaced? None
Est. No. business to be displaced? None

Impacts
Will there be any additional Impacts (Cultural and Environmental Resources): No Will there be any taking of any right-of-way from any public parkland (4F) or schools (6F): No Airports: No Public Hearings: No Environmental Classification (Cat-Ex, EA, EIS): Cat-Ex Transportation Enhancements: None Intermodal: Currently there is no pedestrian crossing at the intersection of Gateway Dr and Washington St

Railroads Crossings

RR Name	No. Xings	No. Tracks and Type of Crossing	Daily Train Movements	Train Speed	Present Protection	Proposed Protection
None						

Purpose and Need Statement For Regional Projects

Segment #1, 8th Ave N to gateway Dr was constructed in 2001 as a plain jointed, doweled concrete pavement. Segment #2, 4-lane segment from Gateway Dr north is concrete pavement that will take further investigation on when exactly it was built, yet it is in a condition that warrants rehabilitation. Segment #3 is concrete pavement constructed with the Cities USACE flood protection project. All three segments are in relatively good condition and at or beyond the time period for a preventative maintenance project to keep them in a state of good repair.

Remarks:

City Engineer: _____ Date: 1/17/18

District Engineer: _____ Date: 1/18/18

Setup Scoring Categories & Factors

Score System: Regional Urban Roads - ND Max. Score: 100

Go Back

Adjust Scoring Categories

(Use TAB key to navigate.)

	Category	Description	Weights		Points		
1	Economic Vitality	Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.	10	%	10	pts	Delete
2	Security	Increase security of the transportation system for motorized and nonmotorized uses.	5	%	5	pts	Delete
3	Accessibility and Mobility	Increase the accessibility and mobility options to people and freight.	15	%	15	pts	Delete
4	Environmental/Energy/QOL	Protect and enhance the environment, promote energy conservation,and improve quality of life.	10	%	10	pts	Delete
5	Integration and Connectivity	Enhance the integration and connectivity of the transportation system across and between modes for people and freight.	10	%	10	pts	Delete
6	Efficient System Management	Promote efficient system management and operation.	5	%	5	pts	Delete
7	System Preservation	Emphasize the preservation of the existing transportation system.	20	%	20	pts	Delete
8	Safety	Increase safety of the transportation system for motorized and nonmotorized uses.	15	%	15	pts	Delete
9	Local/Regional Factors	Factors of local or regional importance	10	%	10	pts	Delete
		TOTAL	100	**%**	100	**pts**	

Add New Category

			Add

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	Bus US 81/Washington St 8th Ave N to 0.4 Miles N of US 2 CPR and Grind - 2021

Category 1 Economic Vitality		
Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.		Assign score 0 or 1
A	Consistent with local, regional or state econimic development plans	0
B	Work located on identified truck route or identified in Freight Study	1
C	Provides new access to jobs and opportunities	0
D	Improves connection to terminal (sea, air, multimodal) on the last mile or two ac	0

Category 2 Security		
Increase security of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Install equipment that monitors the security of the transportation infrastructure	0
B	Consistent with regional emergency/security/hazardous materials movement.	0
C	Coordinates/improves Bridge Closure Management Plan	0
D	Coordinates/improves Special Events Management Plans	0

Category 3 Accessibility and Mobility		
Increase the accessibility and mobility options to people and freight.		Assign score 0 or 1
A	Provides accepatble LOS for facility as recommended in LRTP	0
B	Consistent with access control regulations	0
C	Enhances accessibility and mobility for all modes	0
D	Address LOS deficiency not resolved by another planned project	0
E	Enhances the range of freight service options available to area businesses	0

Category 4 Environmental/Energy/QOL		
Protect and enhance the environment, promote energy conservation,and improve quality of life.		Assign score 0 or 1
A	Demonstrates core context sensitive solutions principles	0
B	Addresses EJ analysis process	0
C	Decreases fuel consumption which reduces greenhouse gas	0
D	Avoids or minimize impacts to wetlands or other natural habitats	1
E	Incoporates innovative stormwater management techniques	0
F	Promotes nonmotorized travel	1

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name Bus US 81/Washington St 8th Ave N to 0.4 Miles N of US 2 CPR and Grind - 2021

Category 5 Integration and Connectivity		
Enhance the integration and connectivity of the transportation system across and between modes for people and freight.		Assign score 0 or 1
A	Reduces excessive travel delays	0
B	Improves direct travel trips between states	0
C	Address last segment/link of corridor	0
D	Improves the integration/connectivity of whole transportation system	0
E	On Regional Primary Road	0

Category 6 Efficient System Management		
Promote efficient system management and operation.		Assign score 0 or 1
A	Incorporates elements from ITS Strategic Plan	0
B	Improving operations without adding through capacity	1
C	Enhances interoperability amoung modal equipment/technologies	0
D	Contributes to better collecting traffic data	0

Category 7 System Preservation		
Emphasize the preservation of the existing transportation system.		Assign score 0 or 1
A	Utilize pavement management system results	1
B	Emphasizes system rehabilitation rather than expansion	1
C	Incorporates technologies new to the MPO area	0
D	Maximizes existing capacity	1
e	Contributes to better system maintenance	1

Category 8 Safety		
Increase safety of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Address locations identified as high crash locations in LRTP, coridor studies, hi	0
B	Enhances safe route to school route	0
C	Consistent with Strategic Highway Safety Plan	0
D	Improves points of conflict	0
E	Enhances the public safety of nonmotorized users	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name Bus US 81/Washington St 8th Ave N to 0.4 Miles N of US 2 CPR and Grind - 2021

Category 9 Local/Regional Factors		
Factors of local or regional importance		**Assign score 0 or 1**
A	Conformance with regional or state plan	1
B	Demonstrates analysis of project risk in implementation	1
C	Provides benefit for multiple transportation agencies	1
D	Advances smart growth objectives	0

PROJECT SCOPING WORKSHEET

DATE: 1/17/2018

PRIORITY: Secondary Regional request for construction in 2022

City: Grand Forks Street: Bus US 81 (1st Ave N to 5th Ave S)

County: Grand Forks Length: ~1,000 ft

Proposed Improvement: Reconstruction of Bus US 81/N Washington St from 1st Ave N to 5th Ave S, Railroad Bridge, and Lift Station.

Cost Estimates Breakdown (in $1,000)							
Alternate	PE	R/W	Utility	Constr.	Bridges	Misc.	Total
				17,600*			17,600*

*Cost is based on the 2012 study inflated @ 4%/year to 2022. This cost does not include the additional $4 million in 2011 dollars (~$6.1 million in 2022) if the southbound lanes on Washington are widened to four lanes as mentioned in the last paragraph on page 83 of the study without the Demers Ave intersection improvements.

Present Road: Surface Width? (one direction) Surface Type? 9" Concrete with
29' Back of Curb to Back of Curb 1-1/2" Asphalt Overlay
32' Retaining Wall/Bridge Pier Face to Bridge Pier Face
On Street Parking Allowed? Present: No Proposed: No

Proposed Improvements

ADT Present: 24,780 Yr: 2013 Travel Way Width : 29' - 29'
ADT Design: 17,600 Design year: 2040 No. of Lanes: 4
Design Speed: 35 MPH Roadway Width:
Maximum Curve: Min. R/W Width: 95-151'
Maximum Grade: Depending on Retaining Wall or Sloped Sides Option

Right of Way

Will Additional ROW or easement be acquired? Yes ROW acquisition by: NDDOT
Has any ROW easements been acquired since 7-1-72: Unknown ROW Condemnation by:
Est. No. of occupied family dwelling to be displaced? 0-1 (eight unit apartment building) depending on if a retaining wall or sloped bank is constructed
Est. No. business to be displaced? 1-4 depending on location of Shoo-fly

Impacts

Will there be any additional Impacts (Cultural and Environmental Resources): Possible, During the public input meeting for the 2012 study on May 5, 2011, the GF Historic Preservation Commission noted potential sites near the project. The potential sites were not detailed in the study.
Will there be any taking of any right-of-way from any public parkland (4F) or schools (6F): No
Airports: No Public Hearings:
Environmental Classification (Cat-Ex, EA, EIS): Documented CatEx
Transportation Enhancements: Temporary closures likely during construction, Improved Bicycle/Pedestrian Sidewalk/Shared Use Path upon project completion
Intermodal: Temporary closures likely during construction.

Railroads Crossings

RR Name	No. Xings	No. Tracks and Type of Crossing	Daily Train Movements	Train Speed	Present Protection	Proposed Protection
BNSF 081328B CASS LK-DL SW Washington St Underpass	1	3 Bridge	9	0-20MPH	Grade Separation	Same

Purpose and Need Statement For Regional Projects

1. The railroad bridge was originally constructed in 1937 as two lanes wide and in 1964 was expanded to four lanes wide. BUS US 81/N Washington St was originally constructed in 1964 under NDDOT project F-FG-608(6). According to record drawings, the cross section was 9" of concrete pavement, on 3" of sand, on 36" of pit run gravel, on 6" of lime treated subgrade. In 1985 this section of road had a concrete grinding project, which according to the record drawings removed an average of ¼". In 2003 there was a project to overlay the concrete with 1-1/2" of Class 31 asphalt. In 2017 there was a project that milled and overlaid the pavement underneath the underpass from approximately Demers Ave to 2nd Ave N.

2. There are a total of four through lanes for north and south bound traffic. Northbound traffic at the northern project limits have a left turn lane for 1st Ave S. The through lanes have an approximate width of 14.5' from the lane line to the face of the curb. Based on aerials the left turn lane appears to be 11' wide.

3. According to the 2012 Washington St Corridor Study, "Concrete cores indicated the main cracking is result of ACR and to a lesser extent ASR. Damage from ACR and ASR is not reversible or repairable: the only long term corrective option is replacement of the affected elements of the structure. The bridge also exhibits deterioration in the superstructure and retaining walls typical of a bridge of this age.". According to the 2012 study, this pavement is reaching the end of its useful life.

4. The existing geometrics do not matter as the proposed project for reconstruction.

5. This study also indicated that all three tracks would need to remain in service during construction. A shoo-fly bridge would need to be constructed and would likely be constructed on the south side to accommodate switching activities. An underpass on the south side of the bridge will likely limit the vertical clearance restricting the size of vehicles that can use the road during construction.

6. There are existing sidewalks and shared use paths which will need to be addressed during the project development phase.

7. Lift Station #183, which provides for removal of storm water from the underpass, will need to be replaced at the same time the structure is replaced based on the relative proximity to the existing retaining walls. In addition, this lift station has a capacity to handle a five year design storm. The 2012 Study recommended that the lift station be replaced with a lift station capable of handling a 25-year design storm event to meet NDDOT design standards.

8. The existing sanitary sewer adjacent to the project was constructed in 1978. At this time it is assumed that no maintenance or replacement work is required.

9. There are street lights on both sides of the road. These street lights are believed to be 40' tall steel poles with davit arms and 250W High Pressure Sodium fixtures, which are believed to be American Electric Lighting No. 115_25S_R3_DG or an equivalent thereof.

10. There are no traffic signals within the project limits. Though the intersection is outside the project limits, the intersection of Washington St and Demers Ave is on the 2016 High Crash Intersection Report #14. No additional turn lanes are needed within the project limits.

Additional information in regards to the proposed project may be found in the following pages, which are excerpts from the 2012 Washington St. Corridor Study.

Remarks:

City Engineer: _____ Date: 1/17/18

District Engineer: _____ Date: 1/18/18

Text not related to the Washington St Underpass

Recommendation: Replace the Existing BNSF Railway Underpass Structure and Adjacent Lift Station #183

Widespread cracking is present in the portion of the pier originally constructed in 1937. Concrete cores indicate the main cracking is result of ACR and to a lesser extent ASR. Damage from ACR and ASR is not reversible or reparable: the only long term correction option is replacement of the affected elements of the structure. The bridge also exhibits deterioration in the superstructure and retaining walls typical of a bridge of this age.

The pavement underneath the bridge structure was constructed in 1964 and is reaching the end of its useful life. Vertical clearance constraints underneath the BNSF Railway Bridge have reduced the potential improvement options underneath the bridge exclusively to pavement rehabilitation. Rehabilitation efforts improve deteriorated sections but do not prevent future deterioration concerns.

Full bridge replacement would alleviate any ASR and ACR issues within the bridge. Additionally, full bridge replacement would address all other concerns to the retaining walls and superstructure. Finally, during bridge replacement, the pavement underneath the bridge could be reconstructed.

Currently, the bridge has retaining walls on three of the four quadrants with a wing wall on the northwest side of the bridge. Sloped sections to the abutment may potentially reduce or eliminate the need for retaining walls. Sloped sections are potentially more aesthetically appealing and the open sides may be more attractive to pedestrian and bicycle activity. It is important to note the proposed grades required to tie in a bridge with sloped sides may create undesirably steep grades adjacent to the former City Detention Hospital, currently used as a multi-resident housing unit. To avoid possible negative impacts at this potentially historic building, a minor retaining wall adjacent to this building may be appropriate. Additionally, bridge replacement with retaining walls does offer cost and ROW benefits.

To balance aesthetic, multimodal, ROW and cost considerations, a combination of sloped sections and retaining walls may be appropriate. This balance would be developed during the environmental document phase of the project. A bridge with sloped sections can be reviewed on FIGURE 7.14 and 7.15 to conservatively highlight the bridge studied with the largest footprint and ROW requirements. FIGURE 7.14 illustrates a bridge with sloped sections, FIGURE 7.15 illustrates a bridge with a combination of sloped sections and retaining walls and FIGURES 7.16 and 7.17 illustrate the proposed bridge dimensions.

All three of the existing tracks would need to remain in service during construction. As a result, a shoo-fly bridge would need to be constructed to detour rail service around the bridge construction. Although the exact design ROW requirements necessary to construct a shoo-fly was beyond the scope of this report, potential impacts were estimated. The two most impactful shoo-fly options were conservatively studied. These options included a full north or south bypass structure. It is important to note that alternative shoo-fly options with reduced impacts may be possible. A shoo-fly routed to the north would potentially impact four (4) buildings. A shoo-fly to the south would impact one building and the railroad maintenance roundhouse. It is important to note that the grades present south of the underpass may limit the vertical clearance that can be provided under the shoo-fly bridge, restricting the size of vehicles that can use the route during construction.. Refer to 7.16 for a graphic illustration of the potential building impacts for a north and south shoo-fly.

Input received during consultation and coordination with representatives of BNSF Railway indicated that a north shoo-fly alignment will be problematic and may not be feasible. In order to provide rail service to the State Mill and Elevator and American Crystal Sugar, BNSF must be able to operate several switches in the vicinity of the bridge. BNSF representatives stated that the switching operation would not be feasible with the north alignment due to their operational requirements.

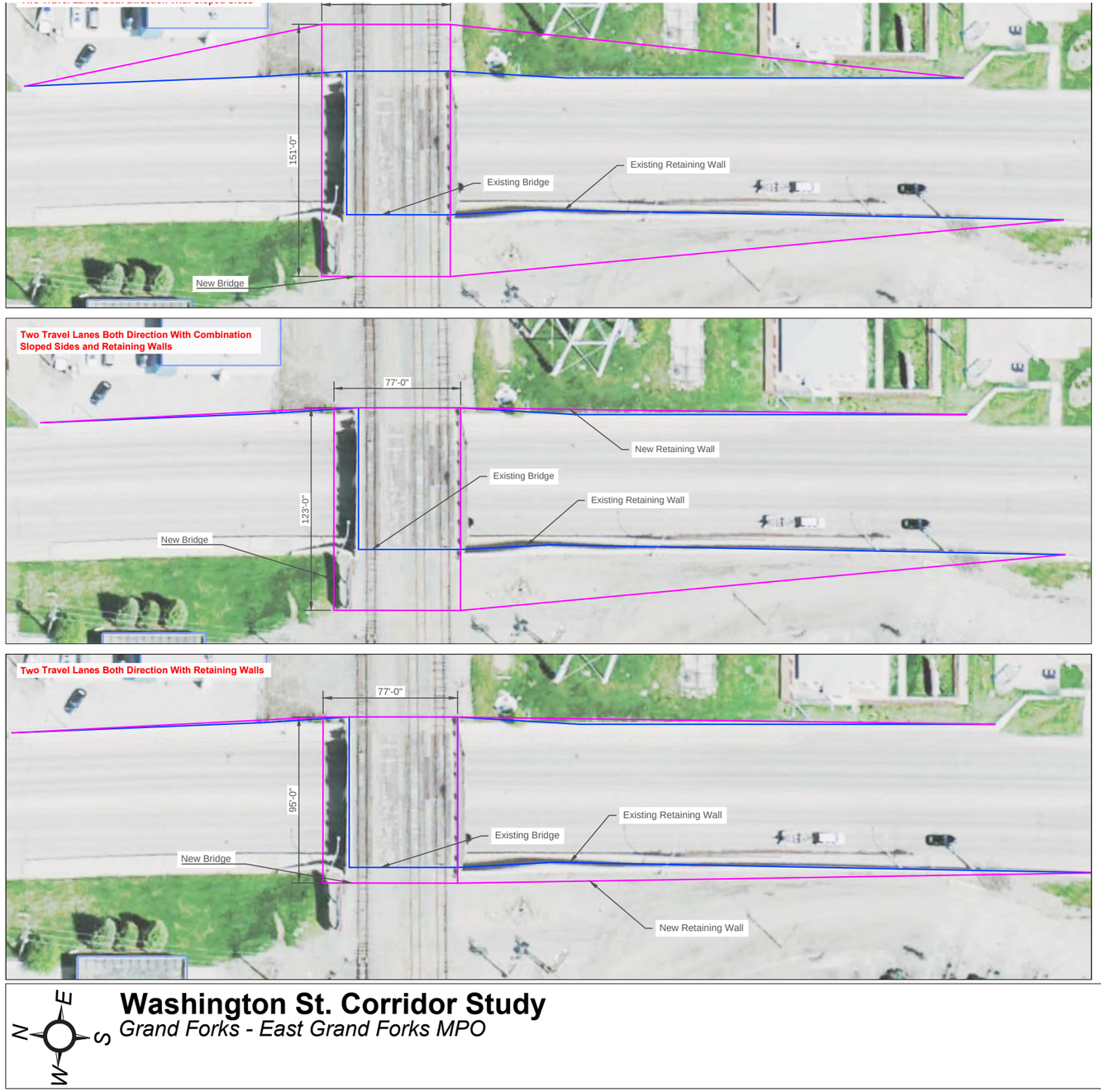
Lift station #183 is approximately three feet from the east BNSF Railway Bridge retaining wall and would need to be replaced and relocated upon bridge improvements. Storm water design calculations performed on the existing drainage area indicate that the existing pumps are sized with capacity for a five-year design storm. It is recommended that reconstruction of this lift station includes upgrades to handle a 25 year storm event to meet NDDOT design standards. Additionally, it is recommended the lift station be equipped with a grit chamber or sediment trap to increase the useful life the station's pumps.

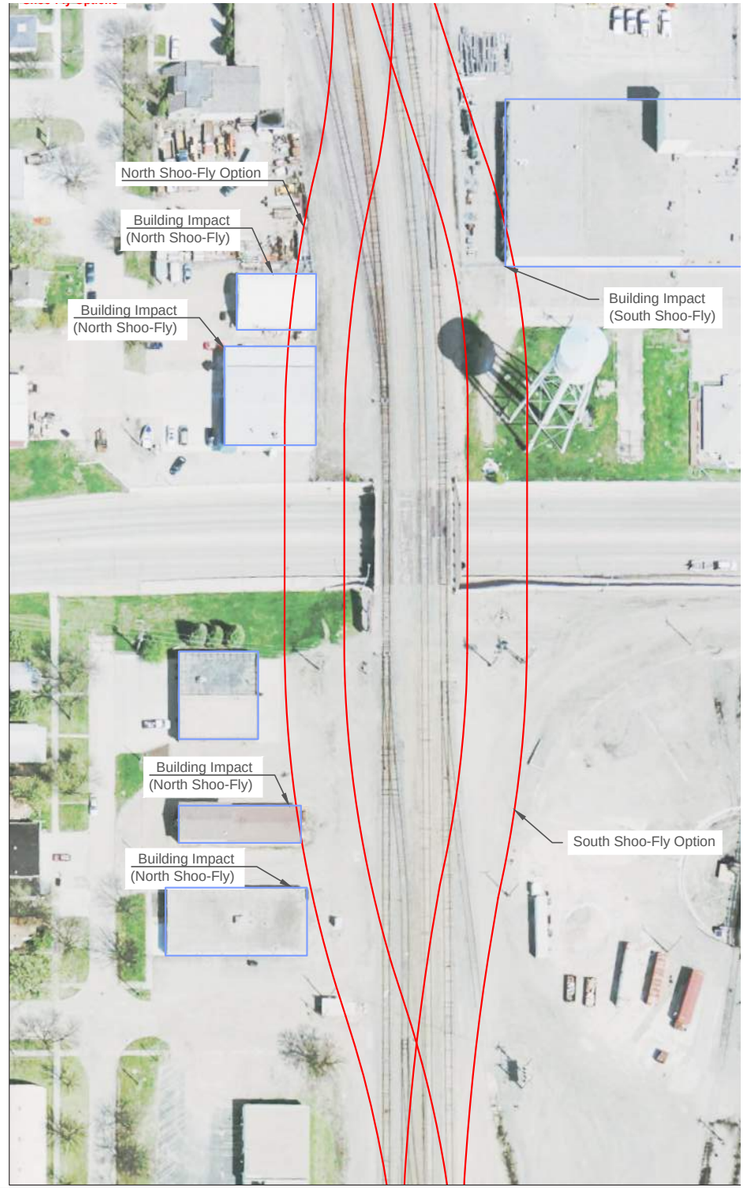
Note that bridge reconstruction should be coordinated with intersection design at the DeMers Avenue intersection to ensure adequate bridge clearance and that Washington Street gradelines are compatible. The DeMers Avenue intersection elevations may need to be modified to meet the desired bridge clearance and approach grades.

If the DeMers Avenue intersection improvements are not implemented, the southbound queue lengths would exceed the distance between the intersection and the bridge during the peak hour of the day. This scenario restricts turning vehicles from entering designated turn lanes. As a result, if the DeMers Avenue intersection improvements are not adopted and scheduled within a reasonable time after bridge reconstruction, it may be necessary to expand the bridge to include 4 southbound lanes to account for vehicle queues. Bridge expansion to include 2 additional southbound lanes would increase the cost of bridge by an estimated $4,000,000 in 2011 dollars. It is important to note that cost estimates that included this additional $4,000,000 was presented to the steering committee. Steering Committee feedback indicated that this additional cost may be impractical. This input was supported by the fact that other than at 17th Avenue South where frontage roads and medians are in place, no location was able to meet NDDOT turn lane length standards. As a result of the input and supporting analysis, this cost was not included in the implementation strategy for the corridor but should be revisited during project development.

FIGURE 7.14 – Proposed BNSF Railway Underpass Improvements (Sloped Section Alternative)

FIGURE 7.15 – Proposed BNSF Railway Underpass Improvements
(Sloped Sections/Retaining Wall Combination Alternative)





Bridge Replacement Options

FIGURE 7.16 – Bridge Replacement Options

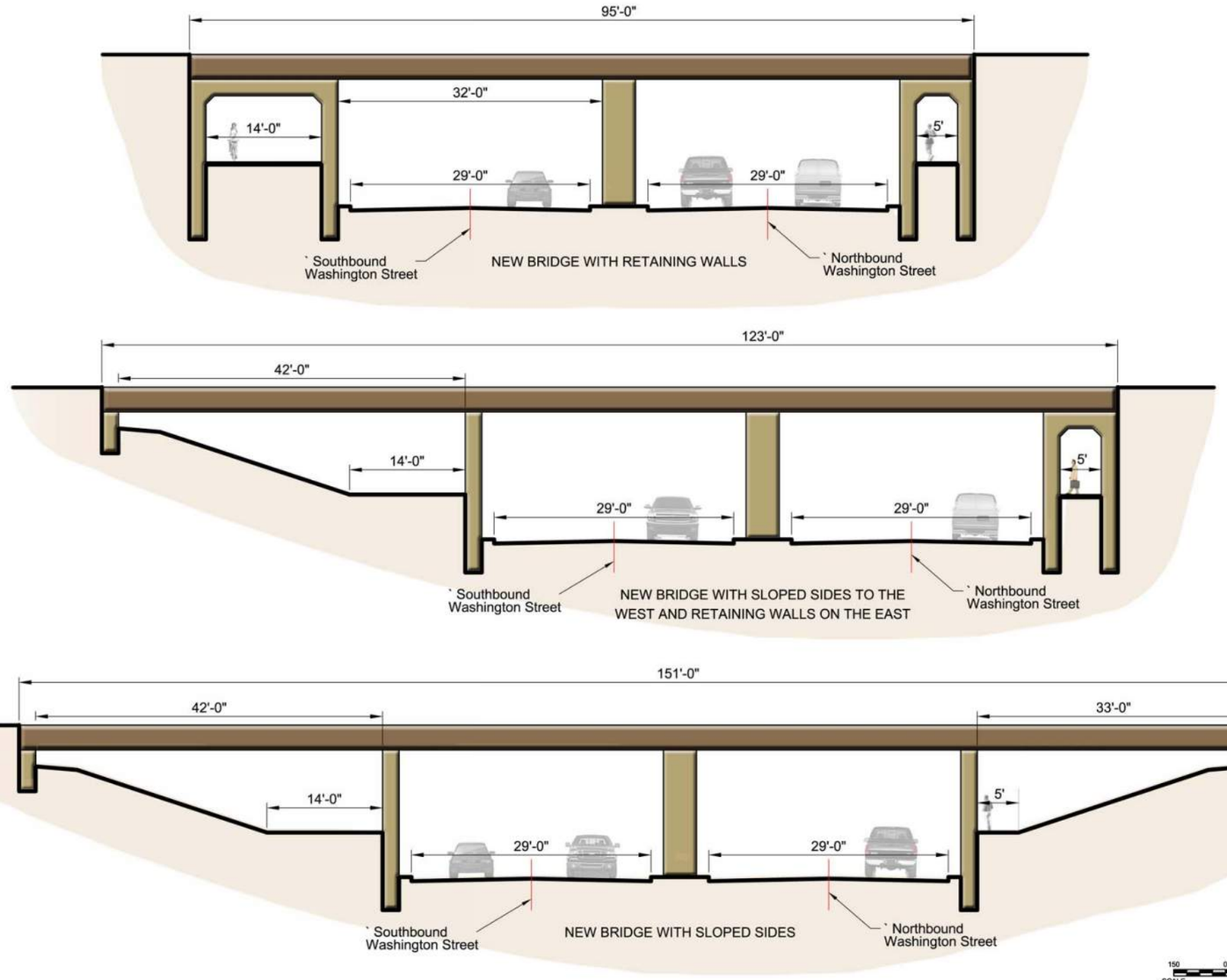


FIGURE 7.17 – Bridge Alternatives - Cross Sections

Discarded Alternative: Short-Term Bridge Repair

Short-term repairs and west bridge span replacement were considered during analysis. Short-term repairs include those measures necessary to ensure the continued functionality of the bridge for the next five years. However, to ensure functionality of the bridge beyond this time period, long-term repairs would need to be completed. As result, the alternative was discarded during analysis.

Discarded Alternative: Partial Bridge Replacement

A west bridge span replacement would include removal and replacement of the west bridge span in conjunction with concrete rehabilitation to the east span. With removal of the west span, the ASR and ACR issues would be removed. Cores from Braun Intertec do not indicate any ASR or ACR in the east span constructed in 1964. At some point in the future, the east span will need to be replaced at a time when the west span is still functional. Splitting the reconstruction into intermittent phases will double the frequency that traffic is impacted. Additionally, the overall cost of splitting the span replacements will be higher than replacing the entire bridge at once due to the cost of installing a shoo-fly required for each replacement. The cost of a shoo-fly was estimated at approximately 1.7 million dollars.

Discarded Alternative: Expand Bridge to Include Additional Lanes

Existing and forecasted 2035 corridor progression and capacity analysis indicated that the corridor is adequately served by the existing lane configuration underneath the bridge if DeMers Avenue intersection improvements are implemented. It is important to note that the design life of the bridge exceeds the study horizon for this project. It was beyond the project scope to consider traffic volumes beyond the year 2035. As a result, it may be appropriate to determine the specific bridge size and corresponding lane arrangement during the environmental project phase.

The southbound through-lane queue lengths at DeMers Avenue are anticipated to terminate approximately 40 feet from the bridge. To prevent queue blockage at the left and right-turn lane, it is recommended turn lanes be extended this distance. Based upon NDDOT design manual standards for turn-lanes, a 96 foot taper length is required from the end of the full-width turn-lane length. To accommodate for these taper lengths, the bridge would need to be extended by two-lane widths. It is important to note that no turn-lanes within the corridor meet NDDOT design standards due to the short block lengths. As a result, the cost associated with providing two additional lanes underneath the bridge to account for the adequate taper length distances was deemed an unnecessary luxury at this tightly constrained location. As such, the alternative was discarded.

Recommendation: Replace the Traffic Signal at 2nd Avenue North with Two-Way Stop Control

The intersection at 2nd Avenue North is not anticipated to meet traffic signal warrants throughout the study horizon. Analysis based upon procedures outlined in the FHWA publication User Guide For Removal of Not Needed Traffic Signals indicate the intersection may experience traffic operational and safety benefits from traffic signal removal. Analysis indicated upon traffic signal removal and two-way stop control installation on 2nd Avenue North, the location is anticipated to experience a reduction in crashes. Additionally, removal of the signal would eliminate any potentially unnecessary stops incurred by mainline Washington Street traffic. Eliminating unnecessary stops would reduce delay and fuel consumption and have minimal effects upon emissions at the intersection.

It is important to note several factors impact the traffic control signal removal decision other than analytical justification. Public opposition, as well as political and institutional considerations should be weighed against the technical findings provided in the report. If the decision is made to remove the candidate traffic control signal, guidelines outlined in the User Guide For Removal of Not Needed Traffic Signals should be followed. Refer to FIGURE 7.18 for a graphic illustration of this option.

Implementation Plan

Methodology

The purpose of this step is to provide the local jurisdictions with the necessary information to address the corridor transportation needs and guide the allocation and investment of transportation funds. This portion of the report identifies all project elements, includes programmatic cost estimates sufficient to include within local and regional Transportation Improvement Programs (TIP), evaluates options for funding sources and prepares a recommended priority-based schedule for implementation.

At the request of the MPO, City and NDDOT, a prioritization plan was identified first. This plan looks at the corridor in isolation and does not account for the transportation needs of the region as a whole and financial constraints resulting from funding other regional projects. The purpose of this plan is to provide decision makers with the necessary information required to make difficult and complicated short and long-term planning decisions.

First the corridor was segmented at logical termini (refer to FIGURE 8.1). Next, the corridor needs were identified to assist in project prioritization (refer to FIGURE 8.2). Corridor needs were tabulated in four categories: safety, infrastructure, multimodal and operational needs. These needs were subsequently rated. A rating of 5 corresponds to a need requiring urgent attention and a rating of 1 corresponds to a need that does not require immediate attention. It is important to note that the rating scale is relative to the perceived needs within the corridor exclusively. For example, a categorical rating of 1 is not to say that a specific corridor need is not essential, but implies that comparatively this improvement is not as urgent as other needs in this category at other locations within the corridor. The purpose of this rating scale is for ordering implementation strategies within the corridor and is not intended for comparative purposes beyond the study limits. Refer to TABLE 8.1 for results of the corridor needs assessment.

TABLE 8.1 – Corridor Needs Assessment

Corridor Segment	Safety	Infrastructure	Multimodal	Operations
8th Avenue to 1st Avenue North	2	3	5	1
1st Avenue North to 5th Avenue South	5	5	4	1
5th Avenue South to 7th Avenue South	5	1	4	5
7th Avenue South to Hammerling Avenue	3	3	5	3
Hammerling Avenue to 17th Avenue South	1	1	1	2

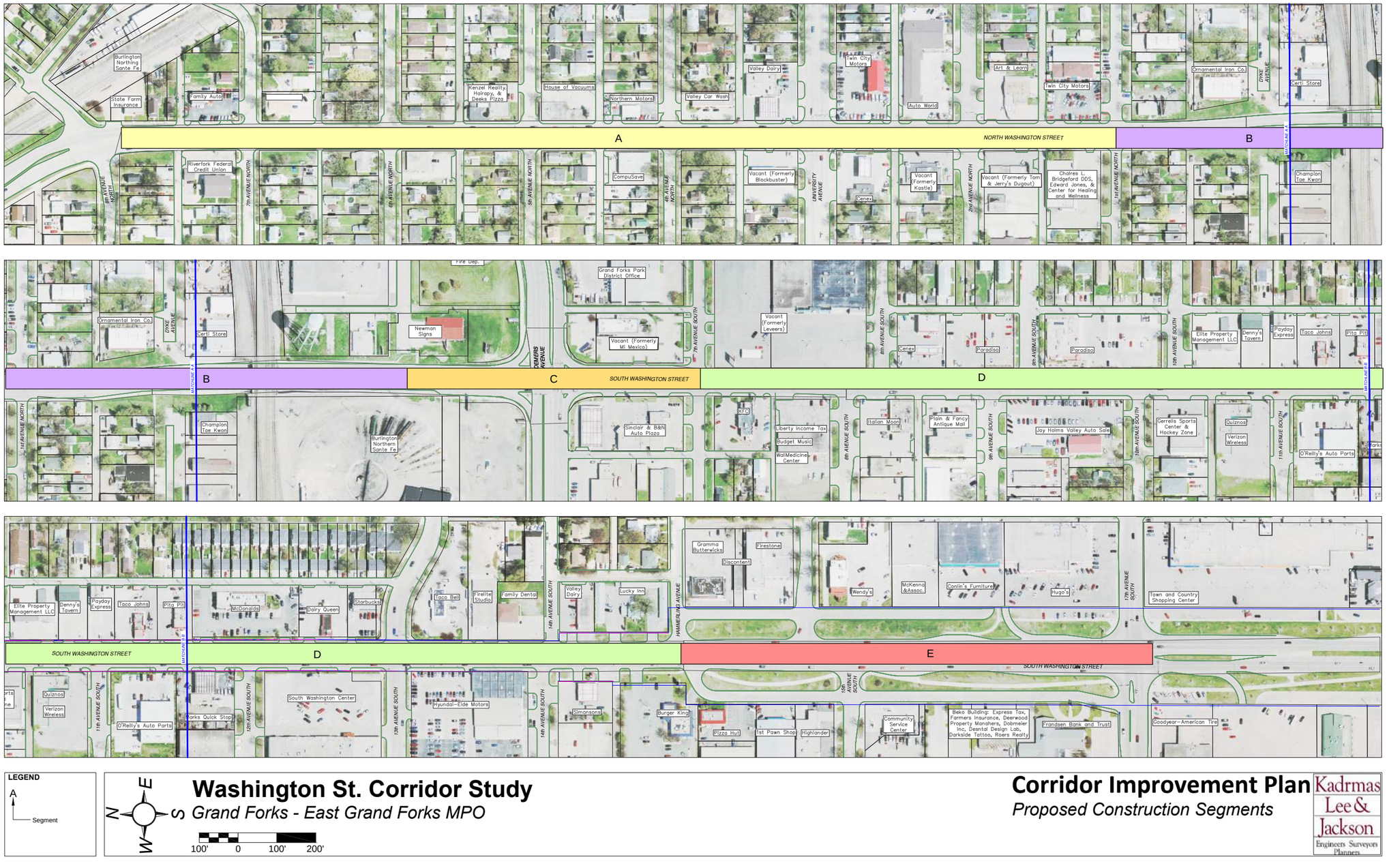


FIGURE 8.1 – Corridor Improvement Plan Proposed Construction Segments

Corridor Needs Matrix

Corridor Segment	Safety	Infrastructure	Multimodal	Traffic Operations
A. 8th Avenue North to 1st Avenue North	*WB approach of 8th Avenue North is approximately 50 feet from railroad tracks. This location meets Warrant 9 requirements for traffic signal installation. *3.7 crashes per year attributed to ingress or egress into private driveways. *NB and SB approaches of University Avenue each experienced 3 left-turn crashes.	* Pavement originally constructed in 1952 with structural overlays in 1970, 1985 and 2002.	*ADA side-slope standards are not met at the majority of driveways. *ADA clearance standards are not met around majority of street lights. *Sidewalks in need of rehabilitation at multiple locations. *No current bicycle accommodations.	*2nd Avenue North intersection does not meet MUTCD traffic signal warrants. Traffic operation benefits are anticipated upon conversion to two-way stop control.
B. 1st Avenue North to 5th Avenue South	*Bridge deterioration may lead to structural instability. *Bridge piers are within close proximity to driving lanes with no protection.	*West span of BNSF railroad bridge structure has irreversible conditions that leads to increased deterioration and an abbreviated useful life *Pavement was constructed in 1964 with no structural overlays since. *Storm sewer lift station #183 adjacent to the BNSF bridge structure is sized for 5 year event (NDDOT requires underpass lift stations to be sized for a 25 year event).	*Water leakage at BNSF bridge retaining wall can create icy sidewalks. *Narrow pedestrian/bicycle path under BNSF bridge structure does not meet AASHTO design standards for bicycles.	*Bridge rehabilitation offers potential to install conduit and fiber optic hardwire to interconnect north and south sides of City.
C. 5th Avenue South to 7th Avenue South	*15.3 rear-end crashes per year at DeMers Avenue intersection. *0.7 pedestrian or bicycle crashes per year at DeMers Avenue intersection. *1.7 SB to EB crashes per year at DeMers Avenue intersection. *1.7 crashes per year at 7th Avenue South intersection attributed to NB DeMers Avenue spillback conditions. *4th Avenue South on-ramp onto DeMers Avenue intersection (0.2 miles from DeMers Avenue intersection) identified as high crash location by NDDOT due to rear-end crash rate. *1.3 crashes per year attributed to ingress/egress into/out of private driveway.	*Pavement has varied sections. The section requiring the most immediate attention is between 5th Avenue South and DeMers Avenue which was constructed in 1964 with no structural overlays. *DeMers Avenue watermain trunk line is cast iron underneath Washington Street and should be replaced with PVC.	*ADA side-slope standards are not met at driveways. *Porkchop islands at DeMers Avenue intersection do not meet current AASHTO design standards. *No bicycle facilities south of DeMers Avenue.	*DeMers Avenue intersection operates at LOS "E" during existing peak-hour and is anticipated to operate at LOS "F" during forecasted peak hour. *NB DeMers Avenue Intersection traffic experiences spillback onto 7th Avenue South.
D. 7th Avenue South to Hammerling Avenue	*9.3 crashes per year attributed to ingress/egress into/out of private driveway. *1.7 crashes per year attributed to through or left-turn movements from the westbound approach of 10th Avenue South (10th Avenue South side-street approaches offset by approximately 100 feet).	*Pavement originally constructed in 1952 with structural overlays in 1974 and mill and overlays in 1985 and 2002.	*No traffic control other than a marked crosswalk at 9th Avenue South to allow pedestrians to cross Washington Street between DeMers Avenue and 13th Avenue South. *ADA side-slope standards are not met at majority of driveways. *Sidewalks in need of rehabilitation at multiple locations. *No current bicycle accommodations. *No bus turn-outs or transit patron amenities.	*The negatively offset intersection of 8th Avenue South (offset by approximately 120 feet) is anticipated to operate at LOS "E" during forecasted peak hour operation. *Negatively offset intersections at 9th, 10th, and 14th Avenues South cause operational issues.
E. Hammerling Avenue to 17th Avenue South		*Pavement was reconstructed in 1997.	*Includes bus turn-outs but does not include transit patron amenities.	*Forecasted 2035 SB 17th Avenue South through queue lengths exceed existing full-width turn-lane lengths. *The positively offset intersection of 15th Avenue South (offset by approximately 90 feet) is anticipated to operate at a LOS "F" during forecasted peak hour operation.

All crash data is from 1/1/2008 to 12/31/2010.

FIGURE 8.2 – Corridor Needs Matrix

During implementation planning, each corridor needs parameter was not weighted equally. First, improvements corresponding to safety in regards to minimizing crashes or potential infrastructure failures were considered. Next, infrastructure needs were considered due to the time sensitive nature of deterioration. Finally, multimodal and traffic operations were considered to promote efficient and convenient vehicular, pedestrian, bicycle and transit traffic flow.

Improvements that could be implemented without full roadway reconstruction were addressed as standalone projects. Standalone projects were much smaller in scope and magnitude than the entire corridor segment projects. As such, these projects were accompanied by much lower associated costs. The lower costs associated with these projects allow for implementation flexibility. Based upon the varying degree of funding, planning and project development between standalone and large-scale reconstruction projects, unique prioritization lists was developed for each. Similar methodology was utilized to develop the standalone project prioritization list. For example, the 2nd Avenue North signal replacement with two-way stop control was the first project prioritized due to the anticipated improvements to crash rates and traffic operations compounded by the inherent long-term cost benefits of the project. Implementing this project first may result in signal maintenance and operation cost savings that could subsequently help pay for other projects in the future.

It is important to note that the implementation plan assumes proper maintenance of the existing and proposed infrastructure including seal coats, structural overlays, concrete pavement repair, restriping, sign maintenance, signal timing modifications, etc. Roadway maintenance requirements may spur project development in an order that disagrees with the following plan. Refer to TABLES 8.2 and 8.3 for details regarding the corridor-specific prioritization plan.

Implementation Plan

TABLE 8.2 – Full Reconstruction Project Priority

Year	Implementation Plan with Regional Considerations	Planning Term	Programming Cost (1st Year of Term)	Programming Cost (Mid-Term Year)	Programming Cost (Last Year of Term)
2016	32nd Avenue South to Hammerling Avenue Preventive Maintenance[1]	Mid-Term 2016-2022	$2,281,224 Federal $1,824,979 State $228,122 Local $228,122	$2,566,067 Federal $2,052,854 State $256,607 Local $256,607	$2,886,476 Federal $2,309,181 State $288,648 Local $288,648
	1st Avenue North to 5th Avenue South Full Reconstruct (Include Underpass Improvements)[2]	Mid-Term 2016-2022	$14,466,859 Federal $11,573,487 State $1,446,686 Local $1,446,686	$16,273,248 Federal $13,018,599 State $1,627,325 Local $1,627,325	$18,305,191 Federal $14,644,153 State $1,830,519 Local $1,830,519
	Alternate Bicycle Route Adjacent to Corridor[3]	Mid-Term 2016-2022	$210,286 Federal $168,229 State $21,029 Local $21,029	$236,543 Federal $189,234 State $23,654 Local $23,654	$266,079 Federal $212,863 State $26,608 Local $26,608
	8th Avenue North to 1st Avenue North Full Reconstruct	Long-Term 2023-2035	$8,017,637 Federal $6,414,110 State $801,764 Local $801,764	$10,144,869 Federal $8,115,895 State $1,014,487 Local $1,014,487	$12,836,495 Federal $10,269,196 State $1,283,650 Local $1,283,650
	7th Avenue South to Hammerling Avenue Full Reconstruct	Long-Term 2023-2035	$10,336,000 Federal $8,268,800 State $1,033,600 Local $1,033,600	$13,078,337 Federal $10,462,670 State $1,307,834 Local $1,307,834	$16,548,269 Federal $13,238,615 State $1,654,827 Local $1,654,827
	Alternate Bicycle Route Adjacent to Corridor[2]	Long-Term 2023-2035	$276,722 Federal $221,378 State $27,672 Local $27,672	$350,142 Federal $280,114 State $35,014 Local $35,014	$443,041 Federal $354,433 State $44,304 Local $44,304
	Traffic Signal Fiber Optic Interconnect	Long-Term 2023-2035	$1,097,052 Federal $877,642 State $109,705 Local $109,705	$1,388,121 Federal $1,110,497 State $138,812 Local $138,812	$1,756,416 Federal $1,405,133 State $175,642 Local $175,642
	5th Avenue South to 7th Avenue South Full Reconstruct (Include DeMers Avenue Intersection Improvements)	Long-Term 2023-2035	$18,758,124 Federal $15,006,499 State $1,875,812 Local $1,875,812	$23,735,011 Federal $18,988,009 State $2,373,501 Local $2,373,501	$30,032,361 Federal $24,025,889 State $3,003,236 Local $3,003,236
2035	2nd Avenue North Intersection Signal Replacement with Two-Way Stop Control, 8th Avenue North Traffic Signal Installation, University Avenue Northbound and Southbound Left-Turn Improvements, 15th Avenue South Right Turn-Lane Installation & 17th Avenue South Turn-Lane Modifications	Part of Another Priority	Part of Another Priority	Part of Another Priority	Part of Another Priority

[1]The majority of this project is beyond the project limits and scope of this study. This cost represents an NDDOT estimate and is not included in the Appendix.
[2]Cost conservatively represents the highest cost bridge alternative. This alternative includes full bridge replacement with sloped sections.
[3]Cost assumes that roadway widening is not required to implement an alternate bicycle route adjacent to the corridor. Additionally the cost assumes that the pedestrian beacon at the intersection of North 15th Sreet and University is relocated to the North 14th Street and University. This improvement is pending Winship Elementary School acceptance

Setup Scoring Categories & Factors

Score System: Regional Urban Roads - ND Max. Score: 100

Go Back

Adjust Scoring Categories

(Use TAB key to navigate.)

	Category	Description	Weights		Points		
1	Economic Vitality	Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.	10	%	10	pts	Delete
2	Security	Increase security of the transportation system for motorized and nonmotorized uses.	5	%	5	pts	Delete
3	Accessibility and Mobility	Increase the accessibility and mobility options to people and freight.	15	%	15	pts	Delete
4	Environmental/Energy/QOL	Protect and enhance the environment, promote energy conservation,and improve quality of life.	10	%	10	pts	Delete
5	Integration and Connectivity	Enhance the integration and connectivity of the transportation system across and between modes for people and freight.	10	%	10	pts	Delete
6	Efficient System Management	Promote efficient system management and operation.	5	%	5	pts	Delete
7	System Preservation	Emphasize the preservation of the existing transportation system.	20	%	20	pts	Delete
8	Safety	Increase safety of the transportation system for motorized and nonmotorized uses.	15	%	15	pts	Delete
9	Local/Regional Factors	Factors of local or regional importance	10	%	10	pts	Delete
		TOTAL	100	**%**	100	**pts**	

Add New Category

			Add

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	Bus US 81/Washington S 5th Ave N to 1st Ave S Reconstruction Underpass - 2022

Category 1 Economic Vitality		
Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.		Assign score 0 or 1
A	Consistent with local, regional or state econimic development plans	0
B	Work located on identified truck route or identified in Freight Study	1
C	Provides new access to jobs and opportunities	0
D	Improves connection to terminal (sea, air, multimodal) on the last mile or two ac	0

Category 2 Security		
Increase security of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Install equipment that monitors the security of the transportation infrastructure	0
B	Consistent with regional emergency/security/hazardous materials movement.	0
C	Coordinates/improves Bridge Closure Management Plan	0
D	Coordinates/improves Special Events Management Plans	0

Category 3 Accessibility and Mobility		
Increase the accessibility and mobility options to people and freight.		Assign score 0 or 1
A	Provides accepatble LOS for facility as recommended in LRTP	0
B	Consistent with access control regulations	0
C	Enhances accessibility and mobility for all modes	1
D	Address LOS deficiency not resolved by another planned project	0
E	Enhances the range of freight service options available to area businesses	0

Category 4 Environmental/Energy/QOL		
Protect and enhance the environment, promote energy conservation,and improve quality of life.		Assign score 0 or 1
A	Demonstrates core context sensitive solutions principles	0
B	Addresses EJ analysis process	0
C	Decreases fuel consumption which reduces greenhouse gas	0
D	Avoids or minimize impacts to wetlands or other natural habitats	1
E	Incoporates innovative stormwater management techniques	1
F	Promotes nonmotorized travel	1

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name Bus US 81/Washington S 5th Ave N to 1st Ave S Reconstruction Underpass - 2022

Category 5 Integration and Connectivity		
Enhance the integration and connectivity of the transportation system across and between modes for people and freight.		**Assign score 0 or 1**
A	Reduces excessive travel delays	0
B	Improves direct travel trips between states	0
C	Address last segment/link of corridor	0
D	Improves the integration/connectivity of whole transportation system	0
E	On Regional Primary Road	0

Category 6 Efficient System Management		
Promote efficient system management and operation.		**Assign score 0 or 1**
A	Incorporates elements from ITS Strategic Plan	0
B	Improving operations without adding through capacity	1
C	Enhances interoperability amoung modal equipment/technologies	0
D	Contributes to better collecting traffic data	0

Category 7 System Preservation		
Emphasize the preservation of the existing transportation system.		**Assign score 0 or 1**
A	Utilize pavement management system results	0
B	Emphasizes system rehabilitation rather than expansion	1
C	Incorporates technologies new to the MPO area	0
D	Maximizes existing capacity	1
e	Contributes to better system maintenance	1

Category 8 Safety		
Increase safety of the transportation system for motorized and nonmotorized uses.		**Assign score 0 or 1**
A	Address locations identified as high crash locations in LRTP, coridor studies, hi	0
B	Enhances safe route to school route	0
C	Consistent with Strategic Highway Safety Plan	0
D	Improves points of conflict	0
E	Enhances the public safety of nonmotorized users	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name Bus US 81/Washington S 5th Ave N to 1st Ave S Reconstruction Underpass - 2022

Category 9 Local/Regional Factors		
Factors of local or regional importance		**Assign score 0 or 1**
A	Conformance with regional or state plan	1
B	Demonstrates analysis of project risk in implementation	1
C	Provides benefit for multiple transportation agencies	1
D	Advances smart growth objectives	0

PROJECT SCOPING WORKSHEET

DATE: 1/17/2017

PRIORITY: Primary & Secondary Regional request for construction in 2022

City: Grand Forks Street: Signalized intersections on State Regional Roads

County: Grand Forks Length:

Proposed Improvement: Traffic Signal Rehabilitation on the Regional Road System**.**

Cost Estimates Breakdown (in $1,000)							
Alternate	PE	R/W	Utility	Constr.	Bridges	Misc.	Total
				6,200			6,200

Present Road: Surface Width? (one direction) Varies Surface Type? Varies

On Street Parking Allowed? Present: No Proposed: No

Proposed Improvements

ADT Present: Yr: Travel Way Width :
ADT Design: Design year: No. of Lanes:
Design Speed: Roadway Width:
Maximum Curve: Min. R/W Width:
Maximum Grade:

Right of Way

Will Additional ROW or easement be acquired? No ROW acquisition by:
Has any ROW easements been acquired since 7-1-72: ROW Condemnation by:
Est. No. of occupied family dwelling to be displaced? None
Est. No. business to be displaced? None

Impacts

Will there be any additional Impacts (Cultural and Environmental Resources): No
Will there be any taking of any right-of-way from any public parkland (4F) or schools (6F):
Airports: No Public Hearings:
Environmental Classification (Cat-Ex, EA, EIS): Categorical Exclusion by Definition
Transportation Enhancements:
Intermodal: Updating outdated GPS Opticom system (Transit has signal priority) as needed
Pedestrian Needs: updating signals to APS pedestrian pushbuttons and signal heads as needed

Railroads Crossings						
RR Name	No. Xings	No. Tracks and Type of Crossing	Daily Train Movements	Train Speed	Present Protection	Proposed Protection
BNSF Mill Spur 081297E	1	1 Concrete	4	0-20MPH	Flashing Lights, Signs	Same
BNSF Glasston 062505C	1	1 Concrete	2	0-25MPH	Gates, Flashing Lights, Signs	Same

Purpose and Need Statement For Regional Projects

By 2022 there are anticipated to be 42 signalized intersections on the regional system in the City of Grand Forks. Of these, over 60% of the signalized intersections will be over 20 years old by 2022, and over 20% will be at least 35 years old by this time. This project is intended to rehabilitate the aging traffic signals on the regional system as needed on a signal by signal basis. This can include replacement of aged conduit and cable, upgrading pedestrian push buttons, replacement of outdated video detection and emergency detection equipment, replacing outdated controller cabinets and associated hardware, replacing aging fiber optic cable, signal heads and installation of new back plates with retroreflective borders. In the older signal systems this can also include rehabilitating the signal poles and mast arms by, sandblasting them free of paint, primer, scale, rust, etc to a clean bare metal surface and applying a fresh coat of epoxy primer and paint. The rehabilitation of these signals will prolong the life of these signals systems, and reduce the downtime and maintenance of signals caused by deteriorating connections, and aging equipment.

1. The street sections at each of these intersections vary considerably in cross section, age and maintenance.

2. The driving lanes and turning lanes vary at each intersection. The proposed project does not include changing these widths.

3. The condition of the street pavements at each of these intersections varies. The purpose of the proposed project does not include any rehabilitation or reconstruction work for the pavement at the proposed intersections.

4. The existing geometrics at each intersection varies. The proposed project does not include modifying any intersection geometrics.

5. The proposed project does not include any geometric or intersection modifications, therefore there should not be any access points of special concern.

6. The existing sidewalks and/or shared use paths located at the intersections vary. The proposed project scope does not include any modifications to sidewalks or shared use

paths.

7. The condition of the existing storm sewer at each intersection vary. No storm sewer work is anticipated with this project

8. The condition of the existing water lines and sanitary sewer lines vary at each intersection. No sanitary sewer or water line work is anticipated with this project.

9. Existing street lights mounted on the traffic signals vary in size, length of mast arm, and luminaire. Each location will be evaluated for rehabilitation work during the project development phase.

10. See the attached sheet for location, age and anticipated level of maintenance for each traffic signal. Signals included in this proposed project located at intersections included in the 2017 High Crash Intersection Report are:
    32nd Ave S & S 34th St #11
    S Washington St & 17th Ave S #14
    Washington St & Demers Ave #24
    32nd Ave S & S 20th St #26
    32nd Ave S & S Columbia Rd #31
    32nd Ave S & S 31st St #40
    32nd Ave S & S Washington St #44
    Demers Ave & 42nd St #46

Turn lanes are outside of the scope of this proposed project.

Remarks:

City Engineer: _____ Date: 1/17/18

District Engineer: _____ Date: 1/18/18

Intersection	Road Classification	Yr of Orig Const or Major Rehab	Intermediate or Minimal Rehabilitation				Age in 2022	Primary Regional					Secondary Regional				
			Rev Yr	Rev Scope	Rev Yr	Rev Scope		Maj Rehab	Int Rehab	Min Rehab	Sandblast	No Work	Maj Rehab	Int Rehab	Min Rehab	Sandblast	No Work
Gateway (US 2) @ N 55th St	Primary Regional	2020					2					X					
Demers Ave @ W Columbia Ramp or 30th St	Secondary Regional	2019					3										X
S Washington (Hwy 81) @ 17th Ave S	Secondary Regional	2014					8										X
S Washington (Hwy 81) @ 24th Ave S	Secondary Regional	2014					8										X
S Washington (Hwy 81) @ 28th Ave S	Secondary Regional	2014					8										X
S Washington (Hwy 81) @ Campbell Drive	Secondary Regional	2014					8										X
Demers Ave @ 3rd St	Secondary Regional	2012					10										X
Demers Ave @ 4th St	Secondary Regional	2012					10										X
Demers Ave @ 5th St	Secondary Regional	2012					10										X
N 5th St @ 1st Ave N	Secondary Regional	2012					10										X
N 5th St @ 2nd Ave N	Secondary Regional	2012					10										X
N 5th St @ University Ave	Secondary Regional	2012					10										X
N 5th St @ 5th Ave N	Secondary Regional	2012					10										X
32nd Ave S @ S 24th St (Walmart)*	Secondary Regional	2006					16								X		
32nd Ave S @ S Columbia Rd*	Secondary Regional	2003					19								X		
32nd Ave S @ S 31st St*	Secondary Regional	2001					21							X			
32nd Ave S @ S 34th St*	Secondary Regional	2001	2008	Lt Turn phase			21							X			
Demers Ave @ 42nd St	Secondary Regional	2001	2017	Cabinet, Ped H&B, Em & Vid Det			21										X
32nd Ave S @ S Washington (Hwy 81)	Secondary Regional	1998	2014	GPS Detection			24							X			
32nd Ave S @ S 20th St*	Secondary Regional	1996	2003	Vid Det			26							X		X	
32nd Ave S @ West I-29 Ramp*	Secondary Regional	1994					28							X		X	
32nd Ave S @ East I-29 Ramp*	Secondary Regional	1994					28							X		X	
32nd Ave S @ 38th St	Secondary Regional	1994	2001	Ped Heads/5 Sec Head	2008	Lt turn phase & vid det	28							X		X	
Demers Ave @ Central Fire Station	Secondary Regional	1994	2017	Cabinet, Em Det			28									X	
Demers Ave @ S 20th St	Secondary Regional	1994	2017	Cabinet, Ped H&B, Em & Vid Det			28									X	
Gateway (US 2) @ East I-29 Ramp	Primary Regional	1994					28		X		X						
Gateway (US 2) @ N 47th St	Primary Regional	1994					28		X		X						
Gateway (US 2) @ West I-29 Ramp)	Primary Regional	1994					28		X		X						
Washington (Hwy 81) @ Demers Ave	Secondary Regional	1994	2017	Cabinet, Ped H&B, Em & Vid Det			28									X	
Demers Ave @ S 34th St	Secondary Regional	1993	2017	Cabinet, Ped H&B, Em & Vid Det			29									X	
Gateway (US 2) @ N 42nd St	Primary Regional	1988					34		X		X						
Gateway (US 2) @ N 20th St	Primary Regional	1987					35		X		X						
Gateway (US 2) @ N 5th St	Primary Regional	1987					35		X		X						
Gateway (US 2) @ N Washington (HWY 81)	Primary Regional	1987					35		X		X						
Demers Ave @ NB Columbia on/off loop/ramp	Secondary Regional	1984	1994	Relocated Poles/5 sec head	2017	Cabinet, Ped H&B, Em & Vid Det	38									X	
Gateway (US 2) @ N 3rd St	Primary Regional	1982	1987	Relocat Poles, new wire			40	X			X						
Gateway (US 2) @ Stanford Rd	Primary Regional	1979	1984	Det Loops	1988	new cable, 5 sec heads	43	X			X						
Washington (Hwy 81) @ 2nd Ave N	Secondary Regional	1976	1985	Controller and Loops			46						X			X	
Washington (Hwy 81) @ 5th Ave N	Secondary Regional	1976					46						X			X	
Washington (Hwy 81) @ University Ave	Secondary Regional	1976	1985	Controller and Loops			46						X			X	
Gateway (US 2) @ Columbia Rd	Primary Regional	1974	1987	Det Loops	1988	New Em Det, Cable	48	X			X						
Washington (Hwy 81) @ 13th Ave S	Secondary Regional	1972	2008	Traffic Signal Modifications	2014	New Vid and Controller	50									X	

Lt Turn phase = Left Turn Phase
Cabinet = Controller Cabinet
Ped H&B = Pedestrian Signal Heads and Push Buttons
Ped Heads = Pedestrian Signal Heads
Vid Det = Video Detection Cameras and equipment
Em Det = Emergency Vechile Detection equipment
Det Loops = Detection Loops
* = May be included in requested HSIP Projects

	General Scope of Work
Maj Rehab	Replacement of Cabinet, Cable/Conduit, Vid Det, Em Det, Ped Push Buttons, Fiber, Signal Heads
Int Rehab	Replacement of Cabinet Equipment, Vid Det, Em Det, Ped Push Buttons, Fiber, Signal Heads
Min Rehab	Replacement of Signal Heads and Backplates, other minor work as needed
Sandblast	Sandblasting and painting of poles and mast arms (signals >25 years old)
No Work	No work is anticipated to take place at this signal

	Primary Regional					Secondary Regional				
	Maj Rehab	Int Rehab	Min Rehab	Sandblast	No Work	Maj Rehab	Int Rehab	Min Rehab	Sandblast	No Work
Quantity	3	7	0	10	1	3	7	2	13	13
Cost/Unit	$250,000	$165,000	$30,000	$100,000	$0	$250,000	$165,000	$30,000	$100,000	$0
Total Cost	$750,000	$1,155,000	$0	$1,000,000	$0	$750,000	$1,155,000	$60,000	$1,300,000	$0
			Primary Regional Total		$2,905,000			Secondary Regional Total		$3,265,000
									Total Construction Regional	$6,170,000

Setup Scoring Categories & Factors

Score System: Regional Urban Roads - ND Max. Score: 100

Go Back

Adjust Scoring Categories

(Use TAB key to navigate.)

	Category	Description	Weights		Points		
1	Economic Vitality	Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.	10	%	10	pts	Delete
2	Security	Increase security of the transportation system for motorized and nonmotorized uses.	5	%	5	pts	Delete
3	Accessibility and Mobility	Increase the accessibility and mobility options to people and freight.	15	%	15	pts	Delete
4	Environmental/Energy/QOL	Protect and enhance the environment, promote energy conservation,and improve quality of life.	10	%	10	pts	Delete
5	Integration and Connectivity	Enhance the integration and connectivity of the transportation system across and between modes for people and freight.	10	%	10	pts	Delete
6	Efficient System Management	Promote efficient system management and operation.	5	%	5	pts	Delete
7	System Preservation	Emphasize the preservation of the existing transportation system.	20	%	20	pts	Delete
8	Safety	Increase safety of the transportation system for motorized and nonmotorized uses.	15	%	15	pts	Delete
9	Local/Regional Factors	Factors of local or regional importance	10	%	10	pts	Delete
		TOTAL	100	**%**	100	**pts**	

Add New Category

			Add

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	Traffic Signal Maintenance Regional Roads - 2022

Category 1 Economic Vitality		
Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.		Assign score 0 or 1
A	Consistent with local, regional or state econimic development plans	0
B	Work located on identified truck route or identified in Freight Study	1
C	Provides new access to jobs and opportunities	0
D	Improves connection to terminal (sea, air, multimodal) on the last mile or two ac	0

Category 2 Security		
Increase security of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Install equipment that monitors the security of the transportation infrastructure	1
B	Consistent with regional emergency/security/hazardous materials movement.	0
C	Coordinates/improves Bridge Closure Management Plan	0
D	Coordinates/improves Special Events Management Plans	0

Category 3 Accessibility and Mobility		
Increase the accessibility and mobility options to people and freight.		Assign score 0 or 1
A	Provides accepatble LOS for facility as recommended in LRTP	0
B	Consistent with access control regulations	0
C	Enhances accessibility and mobility for all modes	1
D	Address LOS deficiency not resolved by another planned project	0
E	Enhances the range of freight service options available to area businesses	0

Category 4 Environmental/Energy/QOL		
Protect and enhance the environment, promote energy conservation,and improve quality of life.		Assign score 0 or 1
A	Demonstrates core context sensitive solutions principles	0
B	Addresses EJ analysis process	0
C	Decreases fuel consumption which reduces greenhouse gas	0
D	Avoids or minimize impacts to wetlands or other natural habitats	1
E	Incoporates innovative stormwater management techniques	0
F	Promotes nonmotorized travel	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number | **Project Name**: Traffic Signal Maintenance Regional Roads - 2022

Category 5 Integration and Connectivity		
Enhance the integration and connectivity of the transportation system across and between modes for people and freight.		**Assign score 0 or 1**
A	Reduces excessive travel delays	0
B	Improves direct travel trips between states	0
C	Address last segment/link of corridor	0
D	Improves the integration/connectivity of whole transportation system	1
E	On Regional Primary Road	1

Category 6 Efficient System Management		
Promote efficient system management and operation.		**Assign score 0 or 1**
A	Incorporates elements from ITS Strategic Plan	0
B	Improving operations without adding through capacity	1
C	Enhances interoperability amoung modal equipment/technologies	0
D	Contributes to better collecting traffic data	1

Category 7 System Preservation		
Emphasize the preservation of the existing transportation system.		**Assign score 0 or 1**
A	Utilize pavement management system results	0
B	Emphasizes system rehabilitation rather than expansion	1
C	Incorporates technologies new to the MPO area	0
D	Maximizes existing capacity	1
e	Contributes to better system maintenance	1

Category 8 Safety		
Increase safety of the transportation system for motorized and nonmotorized uses.		**Assign score 0 or 1**
A	Address locations identified as high crash locations in LRTP, coridor studies, hi	1
B	Enhances safe route to school route	0
C	Consistent with Strategic Highway Safety Plan	0
D	Improves points of conflict	0
E	Enhances the public safety of nonmotorized users	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name Traffic Signal Maintenance Regional Roads - 2022

Category 9 Local/Regional Factors		
Factors of local or regional importance		**Assign score 0 or 1**
A	Conformance with regional or state plan	0
B	Demonstrates analysis of project risk in implementation	1
C	Provides benefit for multiple transportation agencies	1
D	Advances smart growth objectives	0

PROJECT SCOPING WORKSHEET

DATE: 1/17/2017

PRIORITY: Interstate system I-29 for construction in 2023

City: Grand Forks Street: I-29 near 47th Ave S

County: Grand Forks Length: ~1 mile

Proposed Improvement: Address congestion and level of service on Bus US 81/32nd Ave S with the construction of a new interchange bridge, approaches and ramps at 47th Ave S.

Cost Estimates Breakdown (in $1,000)							
Alternate	PE	R/W	Utility	Constr.	Bridges	Misc.	Total
				36,100			36,100

Present Road: Surface Width? 4 lane divided Surface Type? Concrete

On Street Parking Allowed? Present: No Proposed: No

Proposed Improvements

ADT Present: I-29 12,515 - 47th Ave S 2,830 -32nd Ave S 15,325 Yr: 2015
ADT Design: I-29 23,735 - 47th Ave S 17,975 - 32nd Ave S 25,890 Yr: 2040
Travel Way Width : No. of Lanes: 4 & 2
Design Speed: 40 MPH (urban) & 70MPH Interstate Roadway Width: 12 foot lanes
Maximum Curve: Min. R/W Width:
Maximum Grade:

Right of Way

Will Additional ROW or easement be acquired? Yes ROW acquisition by: NDDOT
Has any ROW easements been acquired since 7-1-72: Unknown ROW Condemnation by:
Est. No. of occupied family dwelling to be displaced? None
Est. No. business to be displaced? None

Impacts

Will there be any additional Impacts (Cultural and Environmental Resources): No
Will there be any taking of any right-of-way from any public parkland (4F) or schools (6F): No
Airports: No Public Hearings: Maybe
Environmental Classification (Cat-Ex, EA, EIS): Cat-Ex or EA
Transportation Enhancements: Decreased traffic volume and congestion at 32nd Ave S, improved Level of Service for intersections on Bus US 81/32nd Ave S. This also anticipated to significantly reduced the number of vehicle miles traveled and vehicle hours traveled compared to a no build scenario.
Intermodal: Shared use path on overpass bridge

Railroads Crossings						
RR Name	No. Xings	No. Tracks and Type of Crossing	Daily Train Movements	Train Speed	Present Protection	Proposed Protection
None						

Purpose and Need Statement For Regional Projects

I-29 was originally constructed around 1968, at the time of its construction four interchanges were constructed in or around the city of Grand Forks. These interchanges included: N Washington St, Gateway Dr/US 2, Demers Ave (ND SH 297), and 32nd Ave S/Bus US 81. These interchanges have been in place for nearly 50 years, with no additional interchanges being built within the city limits. There are also two overpasses located at University Ave and at Merrifield Rd/County Rd 6. Over that time the City of Grand Forks has grown from a population of approximately 39,000 to approximately 57,000. Though the city of Grand Forks has grown, the city's growth has been dense with a population density of 2,723people/sq mi. Grand Forks' population density exceeds other similar cities within North Dakota:, Fargo – 2,318people/sq mi, Bismarck - 2,034people/sq mi, West Fargo - 1,924people/sq mi, Minot – 1,719people/sq mi, Williston – 1,083people/sq mi[1].

With the increased population of Grand Forks, comes increased transportation needs, and associated traffic congestion on the existing infrastructure. In the summer of 2017 an I-29 Traffic Operations Report was completed looking at the I-29 corridor around the city. This report noted numerous times that the projected traffic volumes at the most southern existing interchange located at US Bus 81/32nd Ave S would have extreme levels of congestion, traffic cuing onto the interstate, and nearby intersections operating at a level of service F by 2025. This study looked at multiple aspects to prevent these issues from occurring in the future. This included, looking at non interstate improvements to encourage local traffic to use existing arterial roadways, improvements to the existing interchanges, and construction of new interchanges. The Highway Safety Improvement Project on 32nd Ave S/Bus US 81 programmed for 2019, includes installing a video camera and traffic signal programming to flush off ramp traffic if there is substantial backup on the ramp, to prevent traffic from backing up onto the interstate in the short term.

The study first looked at non-interstate improvements to encourage local traffic to use the existing arterial roadway system and reduce the traffic using the interstate. This included widening existing north-south arterial roadways such as 42nd St and Columbia Rd, improving some intersections including a continuous flow intersection, as well as adding dual left turn lanes, and realigning roadways to have better accessibility. The results of this scenario showed that these projects did not reduce demand onto I-29, and in some cases actually increased the volume of traffic onto I-29.

1. http://www.towncharts.com/North-Dakota/Top-25-Cities-in-North-Dakota-ranked-by-Population-Density.html

Another aspect which was explored was improvements to the interchange at 32nd Ave S/Bus US 81. Some of these alternatives included widening 32nd Ave S/Bus US 81, consolidating the east ramp, adding a northwest loop ramp, adding a southwest loop ramp, reconstructing the interchange to a diverging diamond interchange, and a diverging diamond with a partial cloverleaf. Of the available alternatives, only in two scenarios could 95% of the PM peak volumes in 2040 could be processed. In the summary of these alternatives the study states "**None of the alternatives studied under the Existing Interstate Access Scenario, without a 47th Avenue interchange, meet the established [Purpose and Needs] because they cannot improve operations to an acceptable level.**"

This report also evaluated the 32nd Ave S/Bus US 81 interchange with a new interchange constructed at 47th Ave S. By constructing a new interchange at 47th Ave S, traffic volumes on 32nd Ave S/Bus US 81 are forecasted to be reduced by approximately 40%. Evaluating available alternatives under this scenario 32nd Ave S/Bus US 81 could utilize the least expensive option of "Spot Improvements" and would be able to support anticipated traffic volumes and intersections are forecasted to operate at LOS D or better.

The proposed project is to construct a new interchange on I-29 and connect to 47th Ave S. The report identified a number of alternatives for consideration for this interchange. Though the proposed project will develop a selected alternative from the NEPA process proposed in 2020, the cost estimate included in this scoping report is based on the alternative with the highest score in the valuing planning analysis. This alternative identified in the report was for the 47th Ave Shifted Diamond with No Business Impacts.

Remarks:

City Engineer: _____ Date: 1/17/18

District Engineer: _____ Date: 1/18/18

1. http://www.towncharts.com/North-Dakota/Top-25-Cities-in-North-Dakota-ranked-by-Population-Density.html

Project: I-29 and 47th Ave S Interchange Construction
1/25/2018

Estimated Cost	$36,100,000	
Proposed Cost Share		
Federal	80%	$28,880,000
State	10%	$3,610,000
Local	10%	$3,610,000
Total	100%	$36,100,000

32nd Avenue/US 81B

32nd Avenue/US 81B serves a large majority of commercial activity in Grand Forks. Daily traffic volumes from 2015 along this corridor range from approximately 11,300 vehicles per day west of I-29 to 16,300 vehicles per day east of I-29. The areas surrounding I-29 at 32nd Avenue/US 81B and heading south to 47th Avenue are forecasted to be the largest population and employment growth centers in the city. Specifically, 58 percent of new employment opportunities are expected to occur within one-mile of either the 32nd Avenue/US 81B interchange or the 47th Avenue corridor. By 2040, this amount of growth is expected to result in traffic volumes around 43,000 vehicles per day east of I-29 and 23,000 vehicles per day west of I-29. This results in oversaturated interchange operations, producing long delays and queues by 2040.

Analysis completed for the Macro Level Alternatives Analysis found that the construction of a 47th Avenue interchange would have significant tangible benefits to the 32nd Avenue/US 81B interchange, potentially mitigating the need for costly widening at I-29 east to Columbia Road. The 32nd Avenue/US 81B intersection would experience more than 40 percent traffic reduction under this scenario, where other interchanges experienced far less. This necessitated a need to evaluate different interchange scenarios with and without the 47th Avenue interchange. Alternatives were analyzed under the Existing Interstate Access Scenario (no 47th Avenue interchange), which assumes a six-lane section on 32nd Avenue/US 81B, and the 47th Avenue Interchange Scenario, which assumes a four-lane section on 32nd Avenue/US 81B.

The Merrifield Road/CR 6 Interchange Infrastructure will also be considered later in this chapter but had minimal impacts to the overall operations of 32nd Avenue/US 81B. The combination of the 47th Avenue Interchange and the Merrifield Road/CR 6 Interchange provided similar benefits to 32nd Avenue/US 81B as the 47th Avenue interchange in isolation.

ANALYSIS METHODOLOGY

Analysis for this interchange location used the Value Planning approach detailed previously in this report.

INTERCHANGE ALTERNATIVES

EXISTING INTERSTATE ACCESS SCENARIO

As described above, this scenario does not include any additional interchange infrastructure. This means the future development expected in the southwest metro will be funneled to the 32nd Avenue/US 81B corridor for access onto and across the interstate.

Widen Only Alternative

The Widen Only Alternative (WO) would add one through lane in each direction on 32nd Avenue/US 81B from the 42nd Street west frontage road to east of 38th Street, as well as traffic control at the 42nd Street west frontage road and turn lanes at all four study intersections which would require bridge widening. The WO alternative is treated as the baseline for comparisons against other alternative designs; the true do nothing alternative model broke down and could not accurately replicate queues and delay.

Even with the additional capacity, this alternative was unable to be properly calibrated during the 2040 P.M. peak, with 15.2 percent latent demand. This means more than 1,500 vehicles did not enter the model so their delay has not been incorporated into the overall network delay and is not acceptable for analysis.

Based on the traffic the model could process, long queues, in excess of 1,000 feet are expected at all four study intersections. Levels of service are deficient at all study intersections, excluding the East Ramp intersection. It is important to note that the queues extending onto I-29 are likely not being incorporated into the East Ramp delay.

The estimated cost for this alternative was $7.7 million which only included widening the bridge and the difference between reconstructing 32nd Avenue/US 81B as a four-lane section and reconstructing and widening as a six-lane section. This planning level cost should be further refined but was used as a baseline cost. Value planning scores for this alternative can be seen in Table 7-17.

Table 7-17: 32nd Avenue/US 81B Widen Only Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	▪ A.M. Peak Average: 57.1, LOS "E" ▪ P.M. Peak Average: 92.2, LOS "F"	0*
Mainline Operations	▪ Average A.M. Peak: 12.8, LOS "B" ▪ Average P.M. Peak: 94.4 LOS "F"	0*
Environmental Impacts	▪ No additional environmental impacts expected.	8
Safety	▪ Baseline crash potential distribution for alternative comparison: » 6.5% Crossing Crash Potential » 62.5% Rear End Crash Potential » 31.0% Sideswipe Crash Potential	9
Cost	▪ $7.7 Million**	10
Total		27

*Score of zero assigned because model could not be calibrated. Not all delay considered.
**Includes planning level costs on a per mile basis.

Consolidated East Ramp

The Consolidated East Ramp (CER) Alternative would add a through lane in each direction as well as realign 42nd Street east of I-29 with the East Ramp. This helps split southbound traffic at 38th Street, a major bottleneck along the corridor. This alternative also incorporates double left turn lanes at 38th Street, a northbound right turn lane, westbound left and a traffic control signal at the 42nd Street west frontage road. It requires bridge widening. This alternative also incorporates two loops in the southeast and southwest quadrants, which helps eliminate crossing conflicts and improves operational efficiency by allowing a two-phase signal controller.

This alternative had 4.7 percent latent demand during the 2040 P.M. peak, which is acceptable for calibration according to FHWA standards. During the 2040 P.M. peak, operations at 42nd Street frontage road and 38th Street are deficient at LOS "E", while the two ramp intersections operate at LOS "D"; delays at the ramp intersections produce long queues onto the interstate. There are no operational concerns during the 2040 A.M. peak hour.

This alternative reduces crossing crash potential by 24.1 percent and rear-end potential by 49.0 percent when compared against the WO alternative. Sideswipe crash potential is increased by 188.6 percent when compared against the Widen Only alternative.

Value planning scores for this alternative can be seen in Table 7-18 with planning level design layout in Figure 7-26.

Table 7-18: 32nd Avenue/US 81B Consolidated East Ramp Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	» A.M. Peak Average: 18.1, LOS "A" » P.M. Peak Average: 62.0, LOS "E "	5
Mainline Operations	» Average A.M. Peak: 11.92, LOS "B" » Average P.M. Peak: 55.1 LOS "F"	4
Environmental Impacts	» No significant new environmental impacts. 3.5 acres of ROW required.	6
Safety	26.2% increase in crash potential when compared against Widen Only Alternative » 24.1% Reduction in Crossing Crash Potential » 49.0% Reduction in Rear End Crash Potential » 188.6% Increase in Sideswipe Crash Potential	0
Cost	» $30.9 Million	0
Total		15

Northwest Loop Ramp

The Northwest Loop Ramp (NWL) Alternative incorporates a northwest loop on-ramp for westbound to southbound movements, turn lanes at adjacent intersections and traffic control at the 42nd Street west frontage road. This alternative requires widening the 32nd Avenue/US 82B bridge to accommodate additional through lanes. Due to the posted speeds and the ROW constraints, only a small radius could be constructed. This requires parallel merge lanes to ensure safe and efficient merging.

This alternative had 10.0 percent latent demand during the 2040 P.M. peak, which is not acceptable for calibration according to FHWA standards. Nearly 1,000 vehicles were unable to enter the network during the 2040 P.M. peak. However, based on the vehicles processed, the 42nd Street west frontage roads and 38th Street intersections were deficient at LOS "F" with the ramp intersections operating at LOS "E". Queues at the ramp intersection extend onto the interstate, completely blocking all through lanes.

During the 2040 A.M. peak, only the 38th Street intersection is deficient at LOS "E". There are no queueing concerns.

Value planning scores for this alternative can be seen in Table 7-19 with planning level design layout in Figure 7-27.

Table 7-19: 32nd Avenue/US 81B Northwest Loop Ramp Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	» A.M. Peak Average: 39.1, LOS "D" » P.M. Peak Average: 99.4, LOS "F"	0*
Mainline Operations	» Average A.M. Peak: 13.3, LOS "B" » Average P.M. Peak: 54.4, LOS "F"	0*
Environmental Impacts	» No significant environmental impacts. Two acres of ROW required and some access revisions.	6
Safety	14.8% increase in crash potential when compared against Widen Only Alternative » 128.2% Increase in Crossing Crash Potential » 16.4% Reduction in Rear End Crash Potential » 53.6% Increase in Sideswipe Crash Potential	4
Cost	» $27.8 Million	1
Total		11

*Score of zero assigned because model not calibrated. Not all delay considered.

Southwest Loop Ramp

The Southwest Loop Ramp (SWL) Alternative incorporates a southwest loop off-ramp for southbound to eastbound movements, turn lanes at adjacent intersections and traffic control at 44th Street. This alternative requires widening the 32nd Avenue/US 81B bridge to accommodate additional through lanes and access revisions to the 42nd Street west frontage road which allowed for a RIRO access on the northside of 32nd Avenue/US 81B but closed the access on the southside.

This alternative had 3.1 percent latent demand during the 2040 P.M. peak, which is acceptable for calibration according to FHWA standards. During the 2040 P.M. peak, operations at the East Ramp are deficient at LOS "E" with queues that extend onto the interstate. The 38th Street and 44th Street intersections are deficient at LOS "F" and LOS "E" respectively. The 44th Street intersection would be improved with a double left-turn lane. However, that would require two receiving lanes which would have building impacts. At this time, a single left-turn lane was analyzed.

During the 2040 A.M. peak, all intersections operate at LOS "C" or better except the 38th Street intersection which operates at LOS "E". There are no queueing concerns at the ramp intersections.

The SWL Alternative reduces crossing crash potential by 42.1 percent and rear-end crash potential by 40.2 percent. Sideswipe crash potential is increased 88.3 percent.

Value planning scores for this alternative can be seen in Table 7-20 with planning level design layout in Figure 7-28.

Table 7-20: 32nd Avenue/US 81B Southwest Loop Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	» A.M. Peak Average: 27.9, LOS "C" » P.M. Peak Average: 57.6, LOS "E"	5
Mainline Operations	» Average A.M. Peak: 13.2, LOS "B" » Average P.M. Peak: 23.9, LOS "D"	7
Environmental Impacts	» No significant environmental impacts. Two acres of ROW required and some access revisions.	6
Safety	0.5% decrease in crash potential when compared against Widen Only Alternative » 42.1% Reduction in Crossing Crash Potential » 40.2% Reduction in Rear End Crash Potential » 88.3% Increase in Sideswipe Crash Potential	10
Cost	» $23.5 Million	5
Total		33

Diverging Diamond Interchange

The Diverging Diamond Interchange (DDI) Alternative requires the two directions of traffic on 32nd Avenue/US 81B to cross to the opposite side of the road under the I-29 bridge. This allows left-turning and right-turning traffic to perform a free flow movement onto the interstate on-ramp. The free-flowing movements reduce the signal phases to two at each intersection, significantly reducing delays. The right-turn slip ramp on the southbound I-29 on-ramp requires access management at the 42nd Street west frontage road. This alternative requires widening the 32nd Avenue/US 81B bridge to accommodate additional through lanes. A backage road was configured with a signal incorporated at 44th Street.

This alternative had 6.0 percent latent demand during the 2040 P.M. peak, which is not acceptable for calibration according to FHWA standards. More than 600 vehicles were unable to enter the network during the 2040 P.M. peak. However, based on the vehicles processed, the West Ramp intersection and 38th Street intersection were deficient with LOS "E" during the 2040 P.M. peak. Queues at the West Ramp and East Ramp extend back onto the interstate. During the 2040 A.M. peak all intersections operate at LOS "D" or better with no queuing concerns. The DDI alternative increases crossing crash potential by 23.7 percent and sideswipe crash potential by 18.0 percent but decreases rear end crash potential by 9.4 percent.

Value planning scores for this alternative can be seen in Table 7-21: 32nd Avenue/US 81B Diverging Diamond Interchange Alternative (Existing Interstate Access Scenario)with planning level design layout in Figure 7-29.

Table 7-21: 32nd Avenue/US 81B Diverging Diamond Interchange Alternative (Existing Interstate Access Scenario)

	Results (2040 Conditions)	Score
Local Operations	» A.M. Peak Average: 23.2, LOS "C" » P.M. Peak Average: 50.8, LOS "D"	0*
Mainline Operations	» Average A.M. Peak: 13.3, LOS "B" » Average P.M. Peak: 77.0, LOS "F"	0*
Environmental Impacts	» No significant environmental impacts. Two acres of ROW required and some access revisions.	6
Safety	1.3% increase in crash potential when compared against Widen Only Alternative » 23.7% Increase in Crossing Crash Potential » 9.4% Reduction in Rear End Crash Potential » 18.0% Increase in Sideswipe Crash Potential	9
Cost	» $22.1 Million	6
Total		21

*Score of zero assigned because model not calibrated. Not all delay considered.

Diverging Diamond Partial Cloverleaf

Additional analysis was completed for the 2040 P.M. peak hour using a diverging diamond partial cloverleaf design, shown in Figure 7-23. This uses a diverging diamond interchange concept with bypass lanes to a northwest loop ramp and southeast loop ramp. It would require access control at the 42nd Street west frontage road, double left-turn lanes on all approaches at 38th Street and would require significant bridge widening. This design has similar free flow movements and signal phase efficiency as the DDI alternative.

This alternative was only analyzed under the 2040 P.M. peak hour to determine if further analysis should be completed. With 4.7 percent latent demand it was technically calibrated. However, the 44th Street and 38th Street intersections were still deficient and queueing onto I-29 still occurred. Since this alternative did not have acceptable operations, no further analysis was completed.

Figure 7-23: Diverging Diamond Partial Cloverleaf Alternative (Existing Interstate Access Scenario)

Summary of Alternatives Under Existing Interstate Access Scenario

The growth areas planned for the southwest metro result in more than 160 percent growth on 32nd Avenue/US 81B as this corridor is the only access across and onto I-29. This growth results in extreme congestion, to an extent where three of the five alternatives (WO, NWL, DDI) analyzed cannot process at least 95 percent or more of projected 2040 P.M. peak hour traffic, resulting in the inability to properly calibrate the alternatives. The remaining two alternatives that meet calibration standards do not meet local or mainline operations standards, with deficient intersection operations and queues onto the interstate. **None of the alternatives studied under the Existing Interstate Access Scenario, without a 47th Avenue interchange, meet the established PNS because they cannot improve operations to an acceptable level.**

The SWL Alternative scored highest based on the value planning criteria. It was able to accept 97 percent of the forecasted volumes for 2040 P.M. peak but provides deficient local operations. It improves crash potential but does require access management at the 42nd Street west frontage road. The summary of value planning scores is shown in Table 7-22.

Table 7-22: Summary of 32nd Avenue/US 81B Interchange Alternatives Under Existing Interstate Access Scenario

Alternative	Local Operations	Mainline Operations	Environmental Impacts	Safety	Cost	Technical Total	Technical Rank
WO	0	0	8	9	10	27	2
CER	5	4	6	0	0	15	4
NWL	0	0	6	4	2	12	5
SWL	5	7	6	10	5	33	1
DDI	0	0	6	9	6	21	3

47TH AVENUE INTERCHANGE SCENARIO

The 47th Avenue interchange would likely have significant impacts on 32nd Avenue/US 81B, expected to reduce traffic on 32nd Avenue/US 81B by more than 40 percent. The Spot Improvement Alternative was analyzed specifically for the 47th Avenue Interchange Scenario. This alternative includes

- At 38th Street, extend the eastbound right-turn lane (435 feet, full width) and install double left-turn lanes on the eastbound, westbound and southbound approaches.
- At the East Ramp, a double right-turn lane on the northbound off-ramp.
- Traffic control signal and access modification at the 42nd Street west frontage road intersection.
- Queue flushing on the off-ramps
- Pedestrian crossing enhancements at the ramp intersections that includes pedestrian actuation and prohibits right-turns.
- Reconstruct or major rehabilitation of pavement from the East Ramp to Columbia Road.

Under this alternative, all study intersection are LOS "D" or better; the ramp intersections operate at LOS "C" or better during both peak hours through 2040. This alternative would minimize queueing onto the interstate and improve traffic flow, which should mitigate some of the most prevalent crash trends. The signal at the 42nd Street west frontage road and improvements to the existing signal timing should improve pedestrian crossing safety. This analysis suggests constructing a 47th Avenue interchange would mitigate almost all improvements necessary on 32nd Avenue/US 81B.

Value planning scores for this alternative can be seen in Table 7-23 with planning level design layout in Figure 7-30.

Table 7-23: 32nd Avenue/US 81B Spot Improvement Interchange Alternative Under 47th Avenue Interchange Scenario

	Results (2040 Conditions)	Score
Local Operations	▪ A.M. Peak Average: 16.7, LOS "B" ▪ P.M. Peak Average: 31.9, LOS "C"	7
Mainline Operations	▪ Average A.M. Peak: 9.6, LOS "A" ▪ Average P.M. Peak: 18.6, LOS "C"	8
Environmental Impacts	▪ No additional environmental impacts expected.	8
Safety	▪ No change in crash potential expected. » 15.0% Crossing Crash Potential » 33.2% Rear End Crash Potential » 51.8% Sideswipe Crash Potential	6
Cost	▪ $700,000 plus the cost of interchange at 47th Avenue (discussed in next chapter)	10
Total		39

Other Alternatives

Other interchange alternatives were studied under the 47th Avenue Interchange Scenario, which reduces traffic on 32nd Avenue/US 81B by more than 40 percent. These alternatives do provide some benefits to local and mainline operations and safety. Brief descriptions are provided below with a summary table and layouts at the end of this chapter.

Consolidated East Ramp

The Consolidated East Ramp Alternative (CER) was identified in the 2040 LRTP but could not be cost constrained. It would realign 42nd Street east of I-29 with the East Ramp. This helps split southbound traffic at 38th Street, which is a major bottleneck along the corridor. A signal was included for 42nd Street west frontage road. During the 2040 P.M. peak the 38th Street intersection operates deficiently at LOS "E" with long queues on the minor approaches. No queueing or delay concerns during the 2040 A.M. peak.

This alternative comes at a cost of $15.7 million, plus the cost of the interchange at 47th Avenue, estimated between $23.2 and $28.5 million, discussed in the next section.

Value planning scores for this alternative can be seen in Table 7-24 with planning level design layout in Figure 7-31.

Northwest Loop Ramp

The Northwest Loop Ramp Alternative (NWL) adds a loop ramp for the westbound to southbound movements onto I-29 in the northwest quadrant. Due to the posted speeds and the ROW constraints, only a small radius could be constructed. This requires parallel merge lanes to ensure safe and efficient merging, which would likely be incompatible with a 47th Avenue interchange. The addition of the northwest loop helps eliminate crossing conflicts by converting a left-turn to a free right. The right-turn slip ramp on the southbound I-29 on-ramp requires access management at the 42nd Street west frontage road. A backage road was configured with a signal incorporated at 44th Street. During the 2040 P.M. peak all intersections operate efficiently, including 38th Street. However, there are long queues anticipated on the minor approaches at 38th Street. No queuing or delay concerns during the 2040 A.M. peak.

This alternative comes at a cost of $14.2 million, plus the cost of the interchange at 47th Avenue, estimated between $23.2 and $28.5 million, discussed in the next section.

Value planning scores for this alternative can be seen in Table 7-24 with planning level design layout in Figure 7-32.

Southwest Loop Ramp

The Southwest Loop Ramp Alternative (SWL) adds a loop ramp for the southbound to eastbound movements off of I-29 in the southwest quadrant. This configuration supports more than 400 vehicles during the 2040 P.M. peak hour, eliminating one signal phase and permitting right-turn-on-reds to improve through-put. No queueing is expected on the interstate ramps, but large queues build up at 38th Street and the 42nd Street west frontage road. A signal was included for 42nd Street west frontage road. There are some queueing concerns on the minor approaches at 38th Street. All other intersections operate effectively at LOS "D" or better. No queueing or delay concerns during the 2040 A.M. peak.

This alternative comes at a cost of $11.0 million, plus the cost of the interchange at 47th Avenue, estimated between $23.2 and $28.5 million, discussed in the next section.

Value planning scores for this alternative can be seen in Table 7-24 with planning level design layout in Figure 7-33.

Diverging Diamond Interchange

The Diverging Diamond Interchange Alternative (DDI) requires the two directions of traffic on 32nd Avenue/US 81B to cross to the opposite side of the road over I-29. This allows left-turning and right-turning traffic to perform a free flow movement onto the interstate on-ramp. The free-flowing movements reduce the signal phases to two at each intersection, significantly reducing delays. The right-turn slip ramp on the southbound I-29 on-ramp requires access management at the 42nd Street west frontage road. A backage road was configured with a signal incorporated at 44th Street. All intersections operate efficiently during the 2040 A.M. and P.M. peak. There are some queuing issues on the minor approaches at 38th Street during the 2040 P.M. peak.

This alternative comes at a cost of $8.5 million, plus the cost of the interchange at 47th Avenue, estimated between $23.2 and $28.5 million, discussed in the next section.

Value planning scores for this alternative can be seen in Table 7-24 with planning level design layout in Figure 7-34.

Table 7-24: 32nd Avenue/US 81B Alternatives Under 47th Avenue Interchange Scenario

	SI		CER		NWL		SWL		DDI	
	Results	Score	Results	Score	Results	Score	Results	Score	Results	Score
Local Operations	» A.M. Peak: 16.7, LOS "B" » P.M. Peak Average: 31.9, LOS "C"	7	» A.M. Peak: 18.2, LOS "B" » P.M. Peak Average: 37.0, LOS "D"	7	» A.M. Peak: 16.1, LOS "B" » P.M. Peak Average: 24.1, LOS "C"	7	» A.M. Peak: 16.1, LOS "B" » P.M. Peak Average: 33.4, LOS "C"	7	» A.M. Peak: 13.9, LOS "B" » P.M. Peak Average: 23.5, LOS "C"	8
Mainline Operations*	» A.M. Peak: 9.6, LOS "A" » P.M. Peak: 18.6, LOS "C"	8	» A.M. Peak: 14.5, LOS "B" » P.M. Peak: 19.2, LOS "C"	8	» A.M. Peak: 13.3, LOS "B" » P.M. Peak: 18.4, LOS "C"	8	» A.M. Peak: 13.5, LOS "B" » P.M. Peak: 18.0, LOS "C"	8	» A.M. Peak: 13.0, LOS "B" » P.M. Peak: 18.1, LOS "C"	8
Environmental Impacts	» No additional environmental impacts expected.	8	» 3.5 Acres of ROW required. No access changes.	6	» 2 Acres of ROW required. Access management at 42nd Street west frontage road.	6	» 2 Acres of ROW required. No access changes.	6	» 2 Acres of ROW required. Access management at 42nd Street west frontage road.	6
Safety	Baseline Crash Potential Distribution for Comparison » 15.0% Crossing » 33.2% Rear End » 51.8% Sideswipe	6	43.2% Increase in Crash Potential Compared to SI » 140.9% Increase in Crossing Crash Potential » 40.5% Decrease in Rear End Crash Potential » 82.2% Increase in Sideswipe Crash Potential	0	4.1% Decrease in Crash Potential Compared to SI » 0.9% Decrease in Crossing Crash Potential » 10.5% Decrease in Rear End Crash Potential » 0.3% Decrease in Sideswipe Crash Potential	9	5.0% Decrease in Crash Potential Compared to SI » 42.2% Increase in Crossing Crash Potential » 32.0% Decrease in Rear End Crash Potential » 4.9% Increase in Sideswipe Crash Potential	10	20.0% Increase in Crash Potential Compared to SI » 130.9% Increase in Crossing Crash Potential » 7.6% Increase in Rear End Crash Potential » 9.5% Increase in Sideswipe Crash Potential	5
Cost	» $700,000	10	» $15.7 Million	0	» $14.2 Million	1	» $11.0 Million	3	» $8.5 Million	5
Total	39		21		31		34		32	
Rank	1		5		4		2		3	

*Mainline operations does not incorporate friction between 32nd Avenue and 47th Avenue. This is discussed in greater detail in the next section.

47TH AVENUE

During the Macro Level Analysis completed for this study, the 47th Avenue interchange was studied to address future long-term development in southern Grand Forks. This analysis found an interchange at this location would reduce vehicle hours traveled by 4.4 million hours from 2025 to 2040 and vehicle miles traveled by 53.3 million miles from 2025 to 2040. This interchange is also estimated to reduce traffic on 32nd Avenue/US 81B by 40.3 percent, which is likely significant enough to prevent widening on 32nd Avenue/US 81B. However, the analysis also estimated a 21 percent increase in traffic on I-29. This increase in traffic on mainline I-29 may present merging, weaving and diverging challenges. Unlike analysis completed for other interchanges in this report, impacts between 32nd Avenue/US 81B and the 47th Avenue interchange alternatives were analyzed using the existing 32nd Avenue/US 81B on- and off-ramp configurations. Four alternatives were feasible based on the criteria established in this report.

- Traditional Diamond Interchange: A standard diamond interchange on the 47th Avenue alignment was considered the base alternative.
- Diamond with South Loops Interchange: A standard diamond interchange with a southeast loop ramp and southwest loop ramp on the 47th Avenue alignment. This alternative split the diverging movements to minimize the congestion between the 32nd Avenue/US 81B on-ramp and the 47th Avenue off-ramp. This provided improved operations at the ramp intersections by reducing the number of signal phases.
- Shifted Diamond with South Loops Interchange: A standard diamond interchange with a southeast loop on-ramp and southwest loop off-ramp shifted 0.25 miles south. This alternative also splits the diverging movements to minimize congestion but increases the spacing to allow more time for drivers to make the lane changes necessary.
- Shifted Diamond with No Business Impacts Interchange: This alternative is shifted 0.25 miles south and includes a southwest loop ramp for the on- and off-ramps and southeast loop on-ramp. This alternative avoids impacting the campground south of 47th Avenue and increases spacing between the 32nd Avenue/US 81B on-ramp and the 47th Avenue off-ramp.

ANALYSIS METHODOLOGY

These four alternatives were analyzed and presented below using the Value Planning approach detailed at the beginning of this report. The 47th Avenue interchange analysis is slightly different than the baseline methodology because it is a new interchange, with no existing conditions to compare.

MAINLINE OPERATIONS

Because of concerns regarding the I-29 mainline due to spacing and higher volumes, an alternative mainline analysis approach was used. Mainline operations for the 47th Avenue interchange analysis refers to the operations of I-29 between the merge and diverge points of 32nd Avenue/US 81B and 47th Avenue, including the 500-foot sections upstream and downstream of the 32nd Avenue/US 81B and 47th Avenue intersections. This change was made for two reasons: first, none of the alternatives analyzed on 47th Avenue found unique or deficient lane densities on the 500-foot section upstream of off-ramp and downstream of on-ramps; second, the nearly 14,000 ADT increase on I-29 associated with the 47th Avenue interchange could have capacity impacts outside of the interchange influence areas. Similar to the baseline methodology for mainline operations, the northbound and southbound densities were averaged to provide one score.

COST

Typically, the interchange alternatives would be scored using a distribution between highest cost alternative and lowest cost alternative. The Southwest Loop Alternative (SWL) for the 32nd Avenue/US 81B alternative under the Existing Interstate Access Scenario was the prioritized alternative based on technical criteria. The SWL was included in the range of costs to provide valuable context related to the true impacts of a 47th Avenue interchange; it has a cost of $23.5 million. The range of costs was scored using the Cost scoring criteria table established in the methodology section above.

INTERCHANGE ALTERNATIVES

Analysis presented below was completed using ADT forecasts from the 47th Avenue Interchange Scenario.

TRADITIONAL DIAMOND ALTERNATIVE

The Traditional Diamond Alternative (TD) is a standard diamond interchange with signals at the East Ramp, West Ramp and 38th Street intersections. It operates at LOS "D" or better for both 2040 A.M. and P.M. peak hours. There are no queueing concerns that would impact I-29. This alternative provides spacing challenges between the 32nd Avenue/US 81B southbound on-ramp and the 47th Avenue off-ramp, which results in some lane densities that fall to LOS "D" during the 2040 P.M. peak. This alternative will require relocation to the campground in the southwest quadrant but the least amount of right-of-way at 61 acres. Value planning scores for this alternative can be seen in Table 7-25 with planning level design layout in Figure 7-36.

Table 7-25: 47th Avenue Traditional Diamond Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 14.9, LOS "B" ▪ P.M. Peak Average: 32.6, LOS "C"	7
Mainline Operations	▪ A.M. Peak Average: 14.4, LOS "B" ▪ P.M. Peak Average: 29.3, LOS "D"	7
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. Business impacts and relocation necessary. 63 acres of ROW needed.	6
Safety	▪ Baseline crash potential distribution for alternative comparison: » Crossing: 9.4% of total estimated crash potential » Rear End: 81.2% of total estimated crash potential » Lane Change: 9.4% of total estimated crash potential	0
Cost	▪ $24.6 Million	5
Total		25

DIAMOND WITH SOUTH LOOPS ALTERNATIVE

The Diamond with South Loops Alternative (DL) is a diamond interchange with a southeast loop ramp for eastbound to northbound on-ramp movements and a southwest loop ramp for southbound to eastbound off-ramp movements. By removing left-turns, some crossing conflicts are eliminated, as well as enabling the traffic control signal to operate with reduced phases, improving efficiency. This alternative operates effectively during both 2040 A.M. and P.M. peak hours and does not have queueing concerns. This alternative has the lowest estimated crash potential, as well as providing acceptable levels of service for local operations, but does require business impacts and 87 acres of ROW needed, the most of all four build alternatives. As for mainline operations, this alternative does result in some lane densities between 32nd Avenue/US 81B and 47th Avenue falling to LOS "D" during the 2040 P.M. peak. Value planning scores for this alternative can be seen in Table 7-26 with planning level design layout in Figure 7-37.

Table 7-26: 47th Avenue Diamond with South Loops Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 12.0, LOS "B" ▪ P.M. Peak Average: 15.3, LOS "B"	9
Mainline Operations	▪ A.M. Peak Average: 14.8, LOS "B" ▪ P.M. Peak Average: 29.3, LOS "D"	6
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. Business impacts and relocation necessary. 63 acres of ROW needed.	6
Safety	▪ 59.4% Reduction in Crash Potential when Compared Against Diamond » 29.1% reduction in crossing crash potential » 68.1% reduction in rear end crash potential » 15.0% reduction in sideswipe crash potential	10
Cost	▪ $27.2 Million	1
Total		32

DIAMOND WITH SOUTH LOOPS AND MIXING LANES ALTERNATIVE

The Diamond with South Loops and Mixing Lanes Alternative (DLM) is the same interchange configuration as above but includes mixing lanes (also referred to as auxiliary lanes, speed-change lane or acceleration lane) between 32nd Avenue/US 81B and 47th Avenue to improve lane density during the peak hours. This requires about 1,000 feet of extra lane length for each direction of traffic on I-29. These mixing lanes would keep lane densities at LOS "A" during the 2040 A.M. peak and LOS "C" during the 2040 P.M. peak. Local operations, environmental impacts and safety remain unchanged. Value planning scores for this alternative can be seen in Table 7-27. Planning level designs at the interchange are similar to Figure 7-37.

Table 7-27: 47th Avenue Diamond with South Loops and Mixing Lanes Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 12.0, LOS "B" ▪ P.M. Peak Average: 15.3, LOS "B"	9
Mainline Operations	▪ A.M. Peak Average: 10.9, LOS "A" ▪ P.M. Peak Average: 18.8, LOS "C"	8
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. Business impacts and relocation necessary. 63 acres of ROW needed.	6
Safety	▪ 59.4% Reduction in Crash Potential when Compared Against Diamond » 29.1% reduction in crossing crash potential » 68.1% reduction in rear end crash potential » 15.0% reduction in sideswipe crash potential	10
Cost	▪ $28.5 Million	0
Total		33

SHIFTED DIAMOND WITH SOUTH LOOPS ALTERNATIVE

The Shifted Diamond with South Loops Alternative (SDL) is the same geometric design as the South Loops Interchange Alternative, just shifted 0.25 miles south. This improves spacing between the 32nd Avenue/US 81B interchange. This alternative operates effectively both on local and mainline operations. However, during the 2040 P.M. peak, some lane densities fall to LOS "D". This alternative improves estimated crash potential, when compared against the Diamond Interchange. It also impacts the campground and will require a buyout and 78 acres of ROW needed. Value planning scores for this alternative can be seen in Table 7-28 with planning level design layout in Figure 7-38.

Table 7-28: 47th Avenue Shifted Diamond with South Loops Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 11.7, LOS "B" ▪ P.M. Peak Average: 14.5, LOS "B"	9
Mainline Operations	▪ A.M. Peak Average: 14.2, LOS "B" ▪ P.M. Peak Average: 26.8, LOS "D"	7
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. Business impacts and relocation necessary. 78 acres of ROW needed.	5
Safety	▪ 57.5% Reduction in Crash Potential when Compared Against Diamond » 34.8% reduction in crossing crash potential » 66.7% reduction in rear end crash potential » 1.4% reduction in sideswipe crash potential	» 9
Cost	▪ $27.6 Million	1
Total		31

SHIFTED DIAMOND WITH NO BUSINESS IMPACTS

The Shifted Diamond with No Business Impacts Alternative (SNI) shifts the interchange alignment 0.25 miles south and folds the southbound off-ramp to eliminate the business impacts. This alternative operates effectively during both 2040

A.M. and P.M. peak hours with no queueing concerns that would impact I-29. It improves crash potential when compared against the Diamond Interchange alternative with effective local and mainline operations. Eliminating the business impacts and low ROW needed helps this alternative score high in the Environmental Impacts category and Cost. Value planning scores for this alternative can be seen in Table 7-29 with planning level design layout in Figure 7-39.

Table 7-29: 47th Avenue Shifted Diamond with No Business Impacts Alternative

	Results (2040 Conditions – 47th Avenue Interchange Scenario)	Score
Local Operations	▪ A.M. Peak Average: 11.4, LOS "B" ▪ P.M. Peak Average: 16.9, LOS "B"	9
Mainline Operations	▪ A.M. Peak Average: 14.3, LOS "B" ▪ P.M. Peak Average: 26.7, LOS "D"	7
Environmental Impacts	▪ Limited ecological impacts with mitigation possible. No business impacts. 59 acres of ROW needed.	6
Safety	▪ 56.9% Reduction in Crash Potential when Compared Against Diamond » 12.7% increase in crossing crash potential » 70.2% reduction in rear end crash potential » 11.4% reduction in sideswipe crash potential	9
Cost	▪ $23.2 Million	10
Total		41

SUMMARY OF ALTERNATIVES

The Shifted Folded Southbound Off-Ramp Interchange Alternative scored highest on the Value Planning analysis with strong scores in local and mainline operations, safety and low cost. It does not require impacts which improves its environmental impact score relative to other alternatives for 47th Avenue.

The value planning scores summary for 47th Avenue interchange alternatives is shown in Table 7-30.

Table 7-30: Summary of 47th Avenue Interchange Alternatives

Alternative	Local Operations	Mainline Operations	Environmental Impacts	Safety	Cost	Technical Total	Technical Rank
TD	7	7	6	0	5	25	5
DL	9	6	6	10	1	32	3
DLM	9	8	6	10	0	33	2
SDL	9	7	5	9	1	31	4
SNI	9	7	6	9	10	41	1

STEERING COMMITTEE RANKING

As part of the Value Planning workshop, the Steering Committee was asked to rank the alternatives; the Diamond with South Loops and Mixing Lanes and the Shifted Diamond with No Business Impacts were tied with 33.3 percent of the Steering Committee ranking each as their first choice.

those improvements included in the I-29 Corridor Study, none are currently cost constrained in the GF-EGF MPO Long Range Transportation Plan (LRTP).

Needs Comparison

Comparing needs for different improvements can be a very complicated process. For example, how do you compare a railroad grade separation improvement to a new interchange to a new loop? A railroad grade separation generates major delays but only occurs a few times per day, mostly during off-peak periods. A new interchange may provide massive relief for several hours of the day but may not be needed for several years.

The current Transportation Improvement Program (TIP) process utilizes a project scoring and ranking process. A more technically based project specific evaluation process was needed to support the I-29 Corridor Study Implementation Plan. To assess needs, a five point needs index was developed to show relative need. This starts with the technical information compiled in this study and other studies as necessary to compare quantified benefits. Quantified benefits incorporate vehicle hours of delay, vehicle miles travelled and crash reduction factors. For example, the 2040 yearly quantified benefits for an interchange at 47th Avenue is $3.2 million and for a railroad grade separation at 42nd Street and DeMers Avenue is $0.6 million. Where quantified benefits were not readily available, level of service and railroad crossing exposure were compared.

This information was used to provide an educated estimate of need for every improvement over $1 million for existing, 2025 and 2040 time periods. This information will be refined by the Steering Committee. The results are illustrated in Table 8-2.

Table 8-2: Needs by Year

Location	Improvement	Need			
		Existing	2025	2040	Notes
North Washington Street/CR 11/US 81	Interchange and Access Improvements	0	0.5	1	The Washington Street improvements are preventive in nature and not based on quantified deficiencies.
Gateway Drive/US 2	Interchange Improvements	1	2	5	The Gateway Drive interchange operates at LOS "F" by 2040.
	Railroad Grade Separation	2	2.5	3	Queuing onto the interstate when train events and peak hours coincide. The railroad grade separation has a crossing exposure of 245,000 by 2040.*
DeMers Avenue/ND 297	Interchange Improvements	2	4	5	The DeMers Avenue interchange operates at LOS "E" by 2025 and LOS "F" by 2040.
	42nd Street Railroad Grade Separation	3	3.5	4	The grade separation has a yearly quantified benefit of $0.6 million dollars by 2040 and crossing exposure of 749,700 by 2040.*
32nd Avenue/US 81B	New Interchange at 47th Avenue	2	5	5	32nd Avenue Operates at LOS "F" by 2025, has a yearly quantified benefit of $3.2 M by 2040.
Merrifield Road/CR 6	New Interchange	2.5	3	3.5	The Merrifield Interchange has a yearly quantified benefit of 2.4 million dollars by 2040.

0 = No need, 5 = Greatest Need

* Based on previous study, may require updating

LONG RANGE: 2031-2040+

This stage represents year 11 and beyond the current TIP and extends to the life of the current 2040 Long Range Transportation Plan (LRTP). Figure 8-6 demonstrates the long-range phase of project development efforts required to implement the I-29 Corridor Study.

Costs shown demonstrate a year of expenditure estimate to the mid-range of the phase for which construction is anticipated per the I-29 Corridor Study. Projects in the mid-range are adjusted to YOE of 2036. Table 8-3 demonstrates a more descriptive dialogue of the implementation efforts needed at each phase of implementation for the most significant projects. Table 8-3 should be treated as a tentative set of actions needed to address needs identified by the I-29 Corridor Study. As additional planning and programming efforts unfold beyond the completion of the I-29 Corridor Study, these assumptions may change.

Stages of Project Development & Delivery

The I-29 Implementation Plan assists with stratifying the stage of planning and project development required to deliver each of the above mentioned projects. This is specifically important for more of the complex projects and for those projects which will require additional scoping to move out of the planning phase and deeper into advanced project development. The Implementation Plan has been developed around the following generalized Stages of Project Delivery:

- **Planning & Environmental (Preliminary Engineering/Scoping)**: Reflects additional planning or project level scoping to continue to define and delineate alternatives and project feasibility. This phase also includes the transition into the development of relevant environmental documentation. In many cases, the alternatives developed as part of the I-29 Corridor Study are assumed to be ready to move further into project development (i.e. environmental/NEPA). In the case of interchanges at 47th Avenue and Merrifield Road/CR 6, this phase includes completion of an IJR. However, some of these actions may not result in a signed environmental document until such time as Federal funds are programmed, or FHWA fiscal constraint requirements can be met.
- **Right-of-Way, Design and Construction (Advanced Project Development):** Reflects efforts following completion of a signed environmental document. These are stages of advanced project development involving actual final design and right of way. Included in this phase would also be efforts to secure final programming (or project selection). Advanced project development includes the construction phase.

The implementation plan will assign one of these two general categories to identified improvements listed in the I- 29 Corridor Study. Smaller less significant projects which will likely fit more easily into the GF-EGF TIP or move quickly in the first phase or two are not noted. For more complex projects, the transition through these stages is more gradual, and more thoughtfulness is needed on how these projects continue to transition out of planning and further into project development.

32ND AVENUE/US 81B NEEDS

Due to the major investment needed at 32nd Avenue/US 81B, and the coordinated needs between 32nd Avenue/US 81B and 47th Avenue, additional analysis was completed to determine the approximate thresholds where 32nd Avenue/US 81B begins to breakdown. This analysis increased the modeled traffic volumes based on linear growth between the existing and approved 2025 ADT projections and then between the approved 2025 ADT and 2040 ADT projections.

- According to the 2025 P.M. peak hour analysis, deficiencies along the corridor emerged. However, there are key issues that emerge before 2025.
  - » At around 40 percent (2019) of the growth between 2015 and 2025, deficient operations are expected at 38th Street.
  - » By 70 percent (2022) of the growth between 2015 and 2025, the northbound off-ramp begins to queue onto the interstate.
  - » By 2025, deficient operations are expected at the West Ramp, East Ramp and 38th Street intersections during the P.M. peak hour.

- With the Spot Improvements on 32nd Avenue/US 81B, 2025 operations are improved to LOS "D" across the corridor. However, as growth continues capacity constraints on the overpass bridge begin to emerge around 2030, or 30 percent of growth expected between 2025 and 2040. The capacity constraints result in deficient operations at the West Ramp intersection and queues onto the interstate.

Figure 8-2: 2015 to 2025 Growth Thresholds with Existing Configuration on 32nd Avenue/US 81B

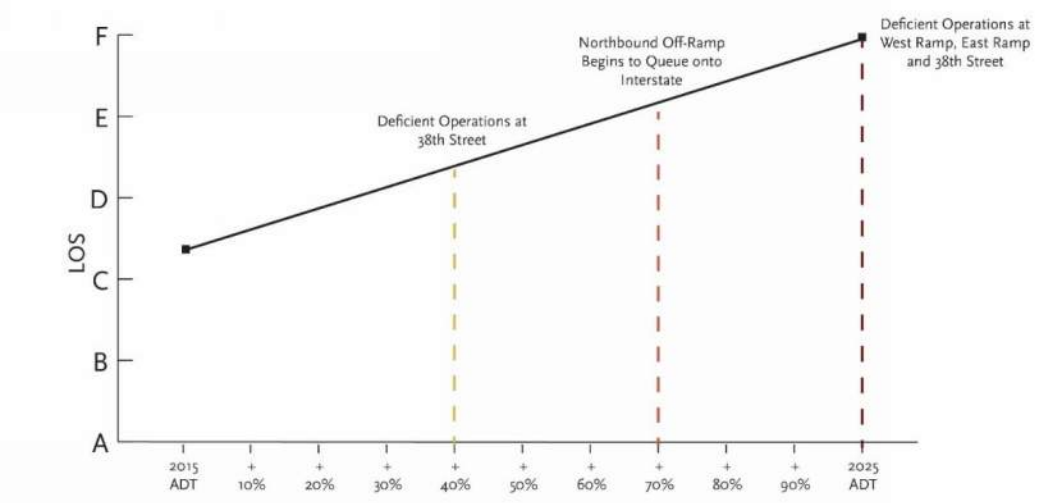
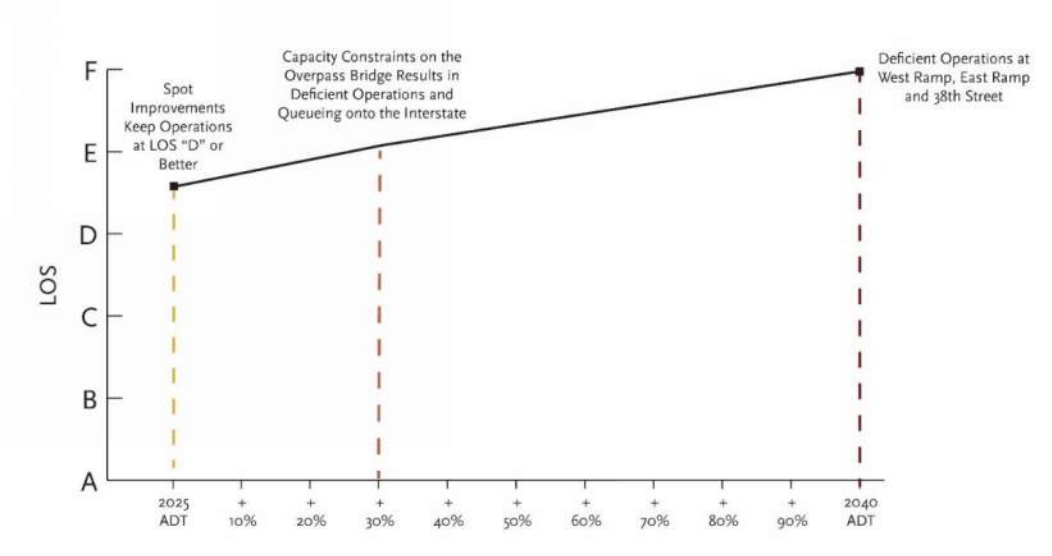


Figure 8-3: 2025 to 2040 Growth Thresholds with Spot Improvements on 32nd Avenue/US 81B



ANCILLARY INVESTMENTS TO SUPPORT 47TH AVENUE INTERCHANGE

As noted, the Implementation Plan for the I-29 Corridor Study is not cost constrained. Further, it is a demonstration of needed improvements more narrowly focused on the I-29 Corridor and adjacent systems. To that end, development of a future interchange at 47th Avenue will require substantial additional investment in local roadways. In current year dollars, total needs to provide local roadway system to support 47th Avenue is estimated at nearly $17.0 million. This system of roadways is shown as part of Figure 8-1 and Figure 8-4, and includes extension and/or completion of 34th Street, 38th Street,

Grade Separation) are shown with a potential for Regional funding. Urban funds are shown on both Regional and or Interstate projects. This is done to indicate that broad partnerships may be needed to fully program these investments on a more accelerated time frame.

Programming Splits

Table 8-5 demonstrates a tentative set of programming and cost splits for the most significant project improvements identified through the I-29 Corridor Study. These cost splits are based upon current local, state and federal funding guidance. More specific guidance regarding local, state and federal funding splits is available in the *NDDOT Local Government Manual*. These splits generally follow that guidance, however Table 8-5 represents a best-case scenario. It is likely many of these improvements will require more local resources to construct improvements in the phases identified by the I-29 Corridor Study.

Table 8-5: Funding Matrix

Project	Total Cost (2017 $)	Total Cost (YOE $)	Funding Split (YOE $)			
			Federal	State	City	County
North Washington/CR 11/US 81						
Access Modification + Ramp Modification	**$5.700**	**$12.489**	$9.99	$1.25	$0.000	$1.25
Gateway Drive/US 2						
Northeast Loop Modification	**$6.600**	**$14.461**	$11.57	$1.45	$1.45	$0.000
Gateway Drive Grade Separation	**$28.300**	**$62.009**	$49.61	$6.20	$6.20	$0.000
DeMers Avenue/ND 297						
42nd Street Grade Separation*	**$40.000**	**$61.578**	$21.55	$0.000	$40.026	$0.000
Capacity Enhancements (No Bridge Widening)	**$7.400**	**$9.003**	$7.20	$0.90	$0.90	$0.000
32nd Avenue/US 81B						
Reconstruct 38th Street to Columbia Road	**$12.000**	**$18.473**	$14.78	$1.85	$1.85	$0.000
47th Avenue						
Construct New Interchange	**$28.500**	**$43.874**	$39.49	$4.39	$0.000	$0.000
Merrifield Road/CR 6						
Modify Overpass to Full Interchange	**$16.480**	**$36.110**	$32.50	$3.61	$0.000	$0.000

** 25% Urban Roads + 10% Regional; Balance of cost Local*
***YOE costs were estimated using the midpoint of the implementation phase for which they are anticipated to be constructed.*

Setup Scoring Categories & Factors

Score System: Regional Urban Roads - ND Max. Score: 100

Go Back

Adjust Scoring Categories

(Use TAB key to navigate.)

	Category	Description	Weights		Points		
1	Economic Vitality	Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.	10	%	10	pts	Delete
2	Security	Increase security of the transportation system for motorized and nonmotorized uses.	5	%	5	pts	Delete
3	Accessibility and Mobility	Increase the accessibility and mobility options to people and freight.	15	%	15	pts	Delete
4	Environmental/Energy/QOL	Protect and enhance the environment, promote energy conservation,and improve quality of life.	10	%	10	pts	Delete
5	Integration and Connectivity	Enhance the integration and connectivity of the transportation system across and between modes for people and freight.	10	%	10	pts	Delete
6	Efficient System Management	Promote efficient system management and operation.	5	%	5	pts	Delete
7	System Preservation	Emphasize the preservation of the existing transportation system.	20	%	20	pts	Delete
8	Safety	Increase safety of the transportation system for motorized and nonmotorized uses.	15	%	15	pts	Delete
9	Local/Regional Factors	Factors of local or regional importance	10	%	10	pts	Delete
		TOTAL	100	**%**	100	**pts**	

Add New Category

			Add

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number		Project Name	I-29 and 47th Ave S Interchange Bridge, approaches, and Ramps - 2023

Category 1 Economic Vitality		
Support the economic vitality of the metropolitan area especially by enabling global competitiveness, productivity, and efficiency.		Assign score 0 or 1
A	Consistent with local, regional or state econimic development plans	0
B	Work located on identified truck route or identified in Freight Study	1
C	Provides new access to jobs and opportunities	1
D	Improves connection to terminal (sea, air, multimodal) on the last mile or two ac	0

Category 2 Security		
Increase security of the transportation system for motorized and nonmotorized uses.		Assign score 0 or 1
A	Install equipment that monitors the security of the transportation infrastructure	0
B	Consistent with regional emergency/security/hazardous materials movement.	0
C	Coordinates/improves Bridge Closure Management Plan	0
D	Coordinates/improves Special Events Management Plans	1

Category 3 Accessibility and Mobility		
Increase the accessibility and mobility options to people and freight.		Assign score 0 or 1
A	Provides accepatble LOS for facility as recommended in LRTP	0
B	Consistent with access control regulations	0
C	Enhances accessibility and mobility for all modes	1
D	Address LOS deficiency not resolved by another planned project	1
E	Enhances the range of freight service options available to area businesses	1

Category 4 Environmental/Energy/QOL		
Protect and enhance the environment, promote energy conservation,and improve quality of life.		Assign score 0 or 1
A	Demonstrates core context sensitive solutions principles	0
B	Addresses EJ analysis process	0
C	Decreases fuel consumption which reduces greenhouse gas	1
D	Avoids or minimize impacts to wetlands or other natural habitats	1
E	Incoporates innovative stormwater management techniques	0
F	Promotes nonmotorized travel	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name I-29 and 47th Ave S Interchange Bridge, approaches, and Ramps - 2023

Category 5 Integration and Connectivity		
Enhance the integration and connectivity of the transportation system across and between modes for people and freight.		**Assign score 0 or 1**
A	Reduces excessive travel delays	1
B	Improves direct travel trips between states	0
C	Address last segment/link of corridor	0
D	Improves the integration/connectivity of whole transportation system	1
E	On Regional Primary Road	1

Category 6 Efficient System Management		
Promote efficient system management and operation.		**Assign score 0 or 1**
A	Incorporates elements from ITS Strategic Plan	0
B	Improving operations without adding through capacity	1
C	Enhances interoperability amoung modal equipment/technologies	0
D	Contributes to better collecting traffic data	0

Category 7 System Preservation		
Emphasize the preservation of the existing transportation system.		**Assign score 0 or 1**
A	Utilize pavement management system results	0
B	Emphasizes system rehabilitation rather than expansion	1
C	Incorporates technologies new to the MPO area	0
D	Maximizes existing capacity	1
e	Contributes to better system maintenance	1

Category 8 Safety		
Increase safety of the transportation system for motorized and nonmotorized uses.		**Assign score 0 or 1**
A	Address locations identified as high crash locations in LRTP, coridor studies, hi	1
B	Enhances safe route to school route	0
C	Consistent with Strategic Highway Safety Plan	0
D	Improves points of conflict	0
E	Enhances the public safety of nonmotorized users	0

TIP SCORING SHEETS

TELUS ASSISTED SCORING
MPO SCORING SHEET FOR EACH PROJECT

0=No
1=Yes

Project Number

Project Name I-29 and 47th Ave S Interchange Bridge, approaches, and Ramps - 2023

Category 9 Local/Regional Factors		
Factors of local or regional importance		**Assign score 0 or 1**
A	Conformance with regional or state plan	0
B	Demonstrates analysis of project risk in implementation	1
C	Provides benefit for multiple transportation agencies	1
D	Advances smart growth objectives	0